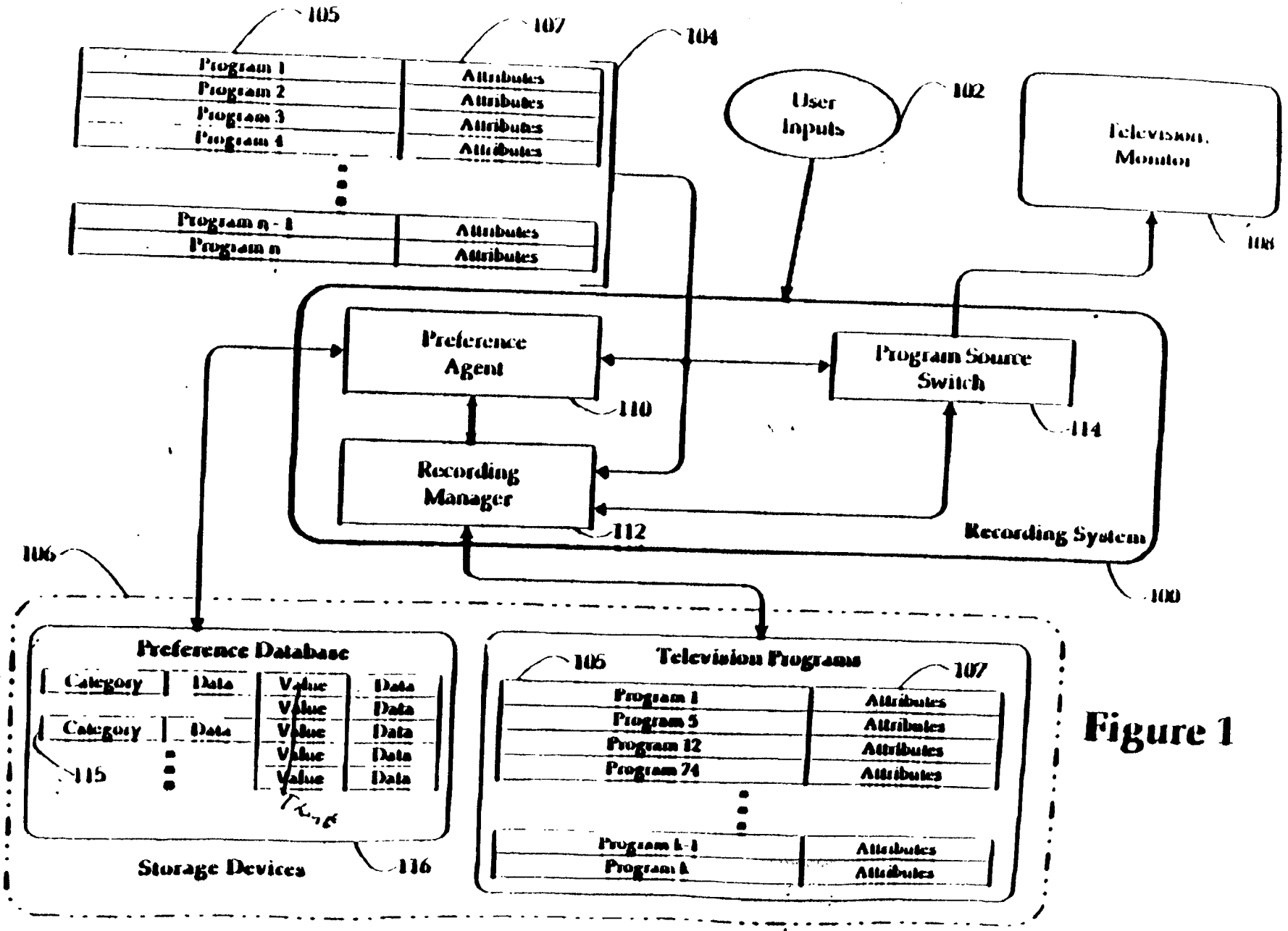

105
107
104
Program 1
Program 2
Program 3
Program 4
Attributes
Attributes
Attributes
Attributes
Program n - 1
Program n
Attributes
Attributes
User Inputs
102
Television Monitor
108
Preference Agent
110
Program Source Switch
114
Recording Manager
112
Recording System
100
106
Preference Database
Category
Data
Value
Data
Value
Data
Value
Data
Value
Data
Value
Data
115
Storage Devices
116
Television Programs
105
107
Program 1
Program 5
Program 12
Program 74
Attributes
Attributes
Attributes
Attributes
Program k-1
Program k
Attributes
Attributes

Figure 1

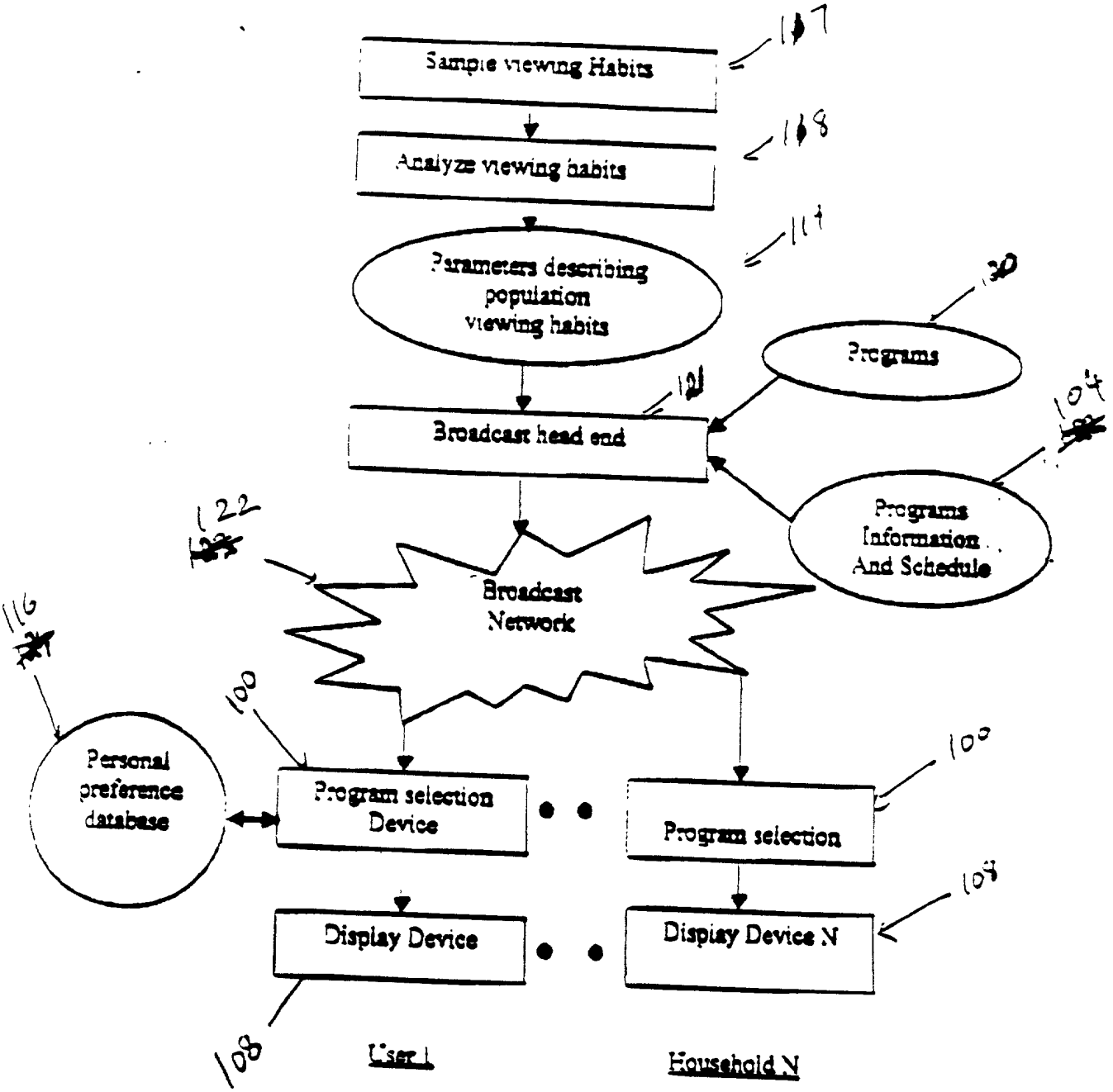

Sample viewing Habits
Analyze viewing habits
Parameters describing population viewing habits
Programs
Broadcast head end
Programs Information And Schedule
Broadcast Network
Personal preference database
Program selection Device
Program selection
Display Device
Display Device N
User 1
Household N

Figure 2

Examples of Program Information

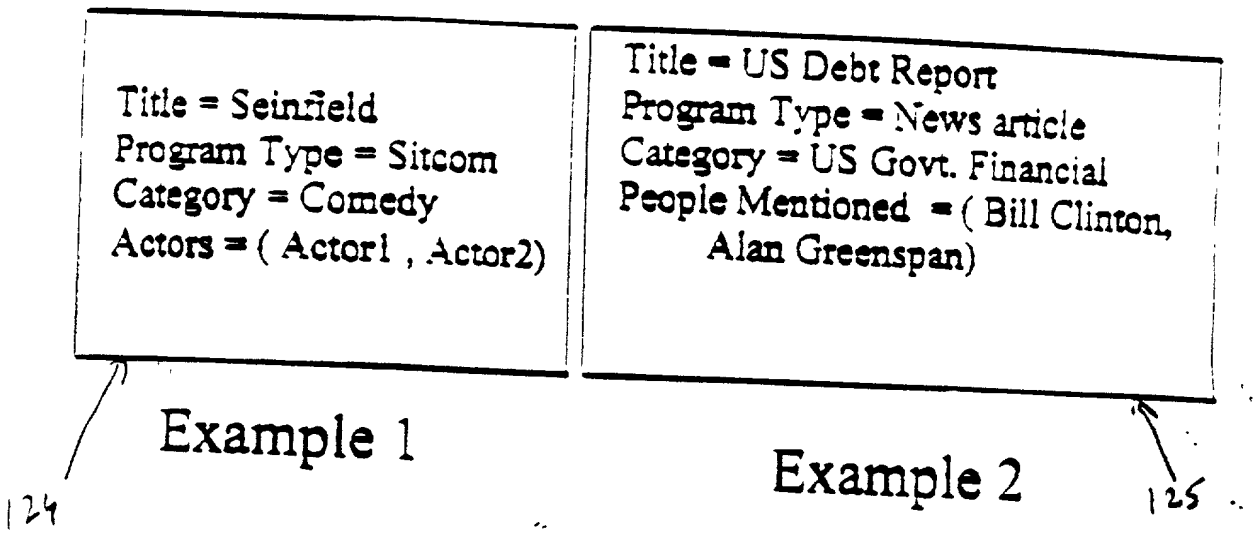


Figure 3

Examples for traits

Movie
Adventure
Sports
Mad About You
dynamic trait 1
Dynamic trait 2
NBC NEWS
FRIDAY Movie
Premier Mad About You

126

Examples for Liking for viewer N

Movie = [illegible]
Adventure = [illegible]
Sports = 0.3
Mad About You = 5
dynamic trait 1 = 3
Dynamic trait 2 = 5
NBC NEWS = 13
FRIDAY Movie = 18
Premier Mad About You = 15

127

Figure 4

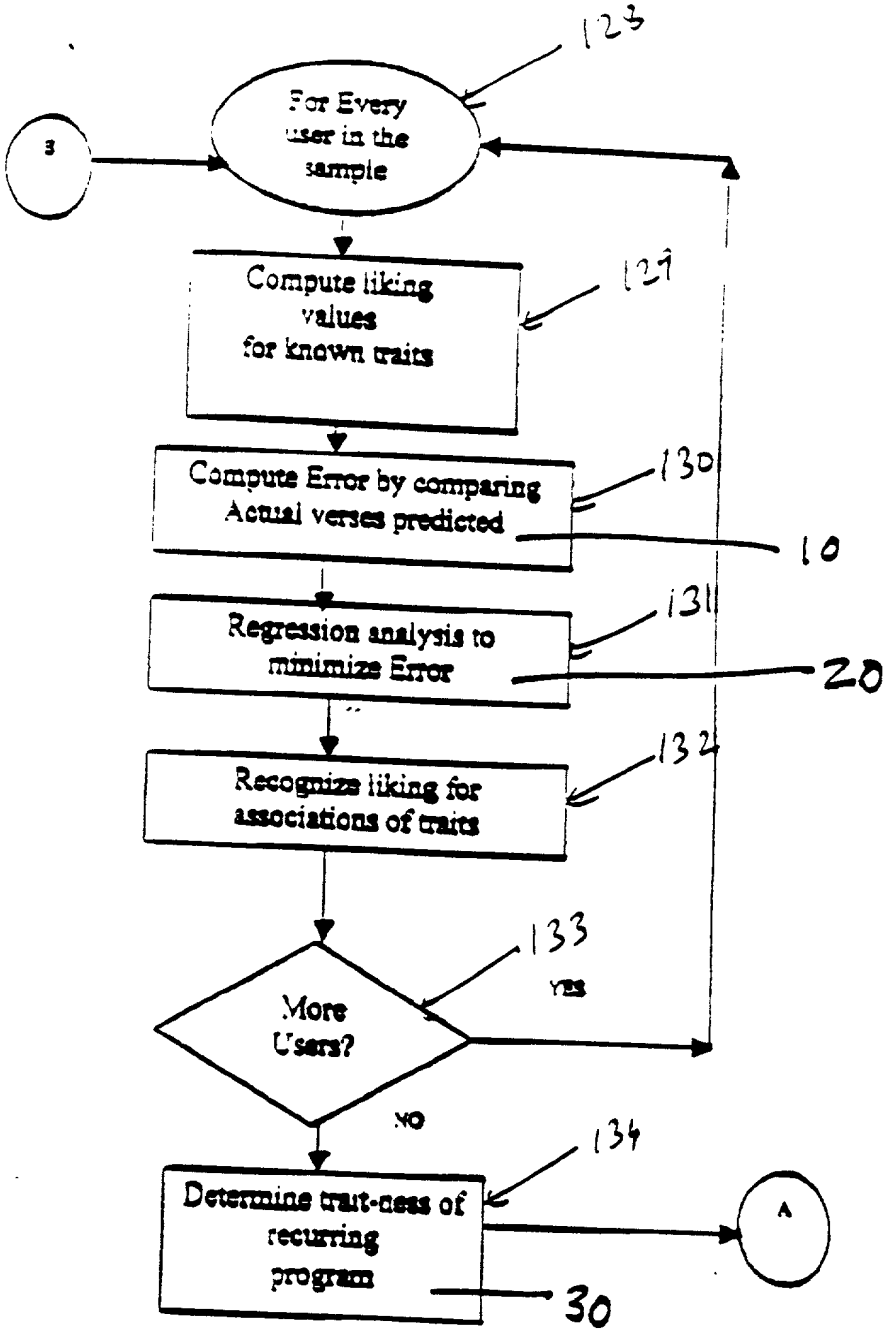

123
For Every user in the sample
3
Compute liking values for known traits
129
Compute Error by comparing Actual verses predicted
130
10
Regression analysis to minimize Error
131
20
Recognize liking for associations of traits
132
More Users?
133
yes
NO
Determine trait-ness of recurring program
134
30
A

Figure 5(a)

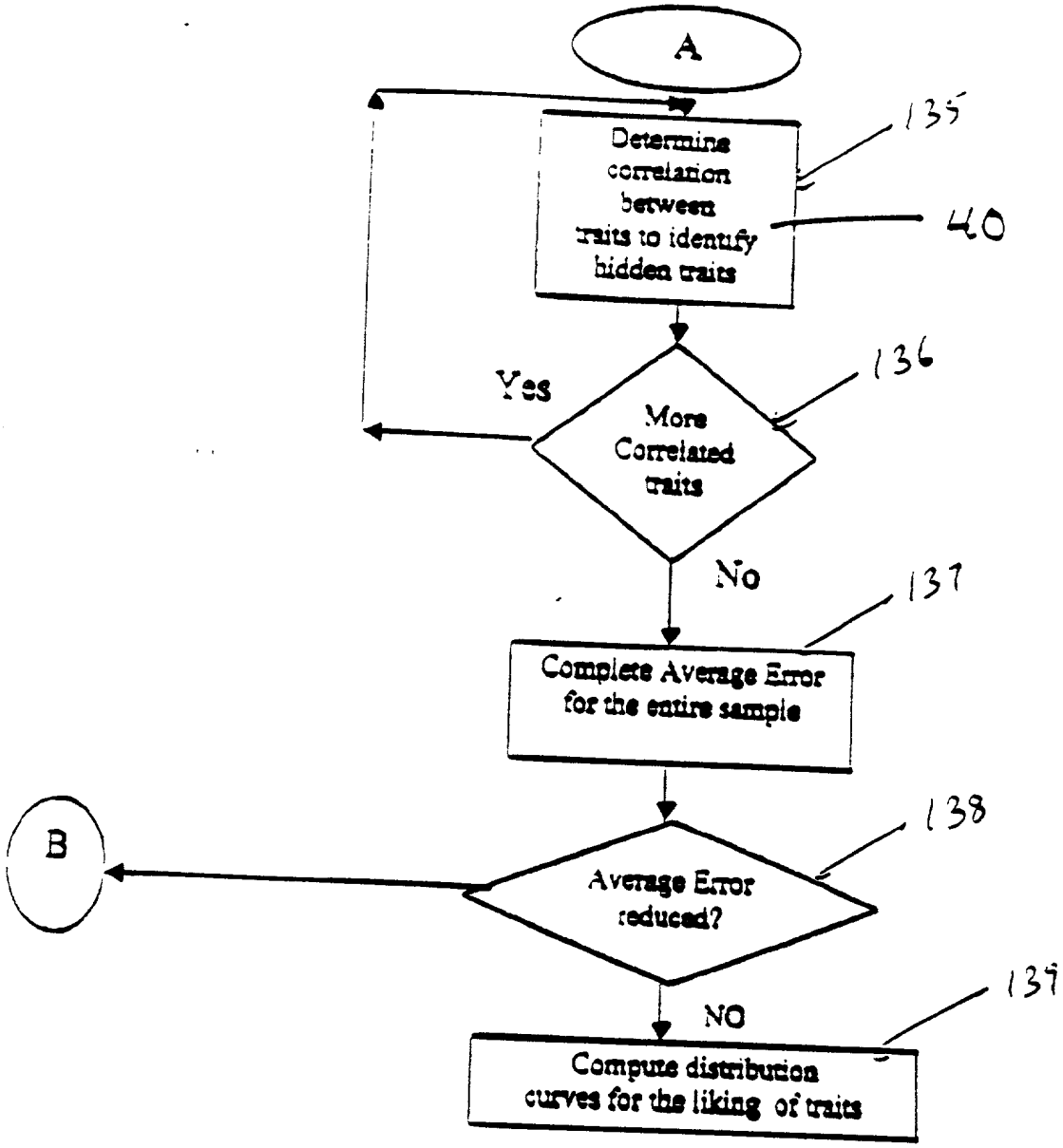

A
Determine correlation between traits to identify hidden traits
135
40
More Correlated traits
136
Yes
No
Complete Average Error for the entire sample
137
B
Average Error reduced?
138
NO
Compute distribution curves for the liking of traits
139

Figure 5 (b)

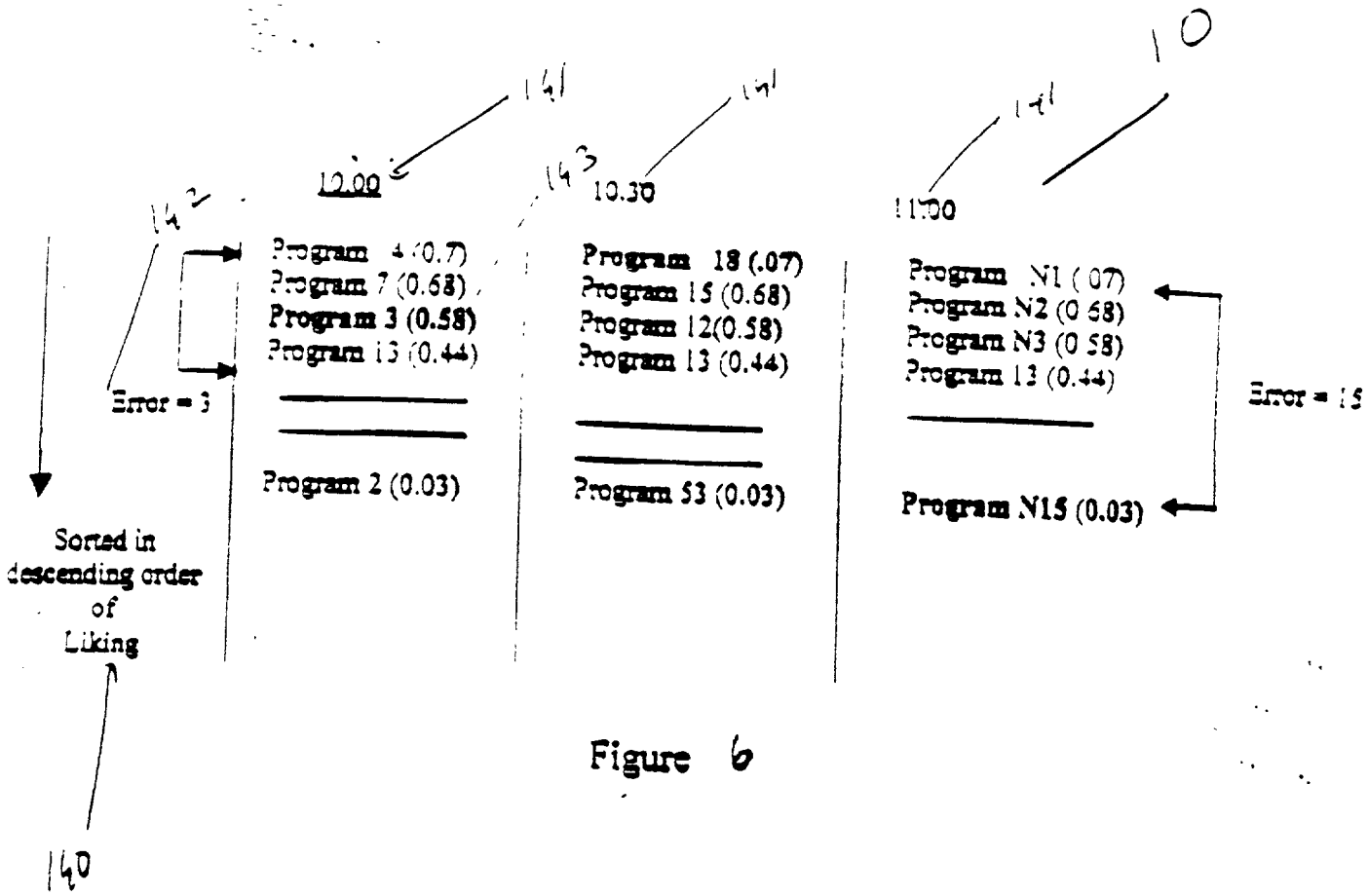

10
141
141
141
10.00
10.30
11:00
142
143
Program 4 (0.7)
Program 7 (0.68)
Program 3 (0.58)
Program 13 (0.44)
Program 2 (0.03)
Program 18 (.07)
Program 15 (0.68)
Program 12(0.58)
Program 13 (0.44)
Program 53 (0.03)
Program N1 (07)
Program N2 (0 58)
Program N3 (0 58)
Program 13 (0.44)
Program N15 (0.03)
Error = 3
Error = 15
Sorted in descending order of Liking
140

Figure 6

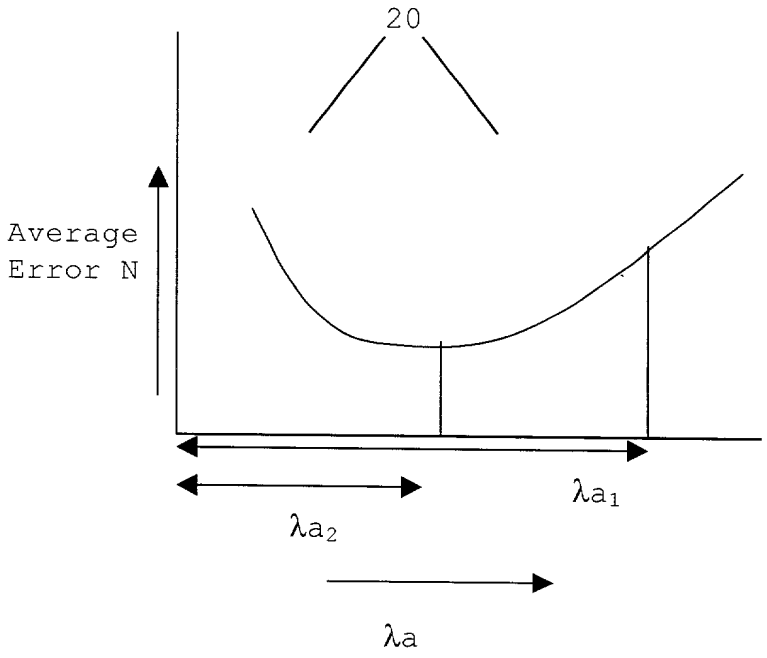
Figure 7

Current Liking Value

$\lambda a_1 = 2$
$\lambda b_1 = 5$
$\lambda c_1 = -3$
$\lambda d_1 = 0$

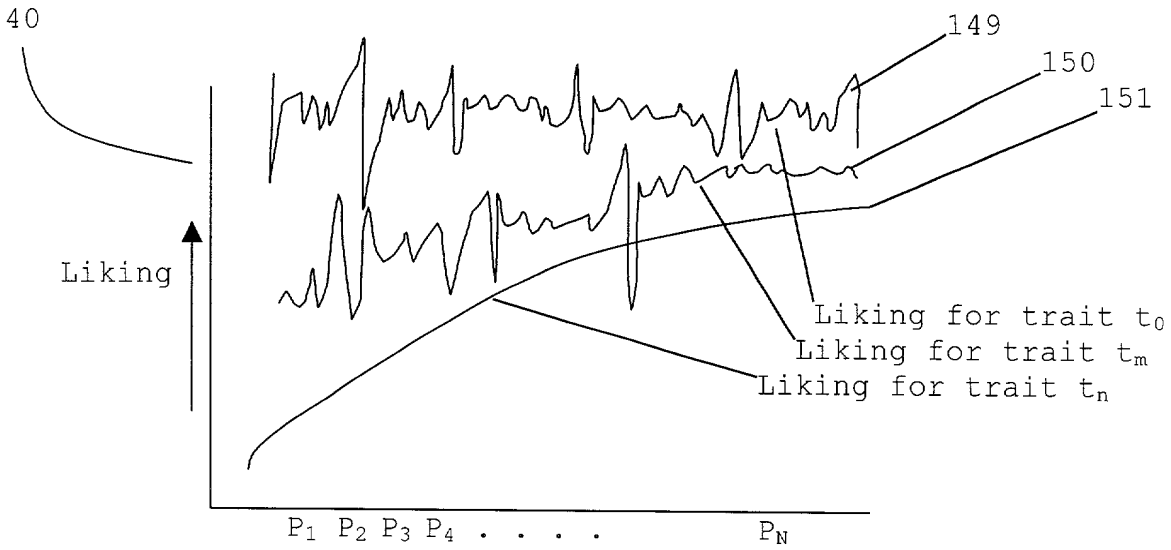
Next Liking Value

$\lambda a_2 = 1.5$
$\lambda a_1 = 5$
$\lambda a_1 = -3$
$\lambda a_1 = 0$



($\lambda b = \lambda b_1$
$\lambda c = \lambda c_1$
$\lambda d = \lambda d_1$
.
.
.)

Figure 8



t_m and t_n are correlated

t_m can be expressed as $t_m = t_x + t_m'$

and t_n can be expressed as $t_n = a_x t_x + t_n'$

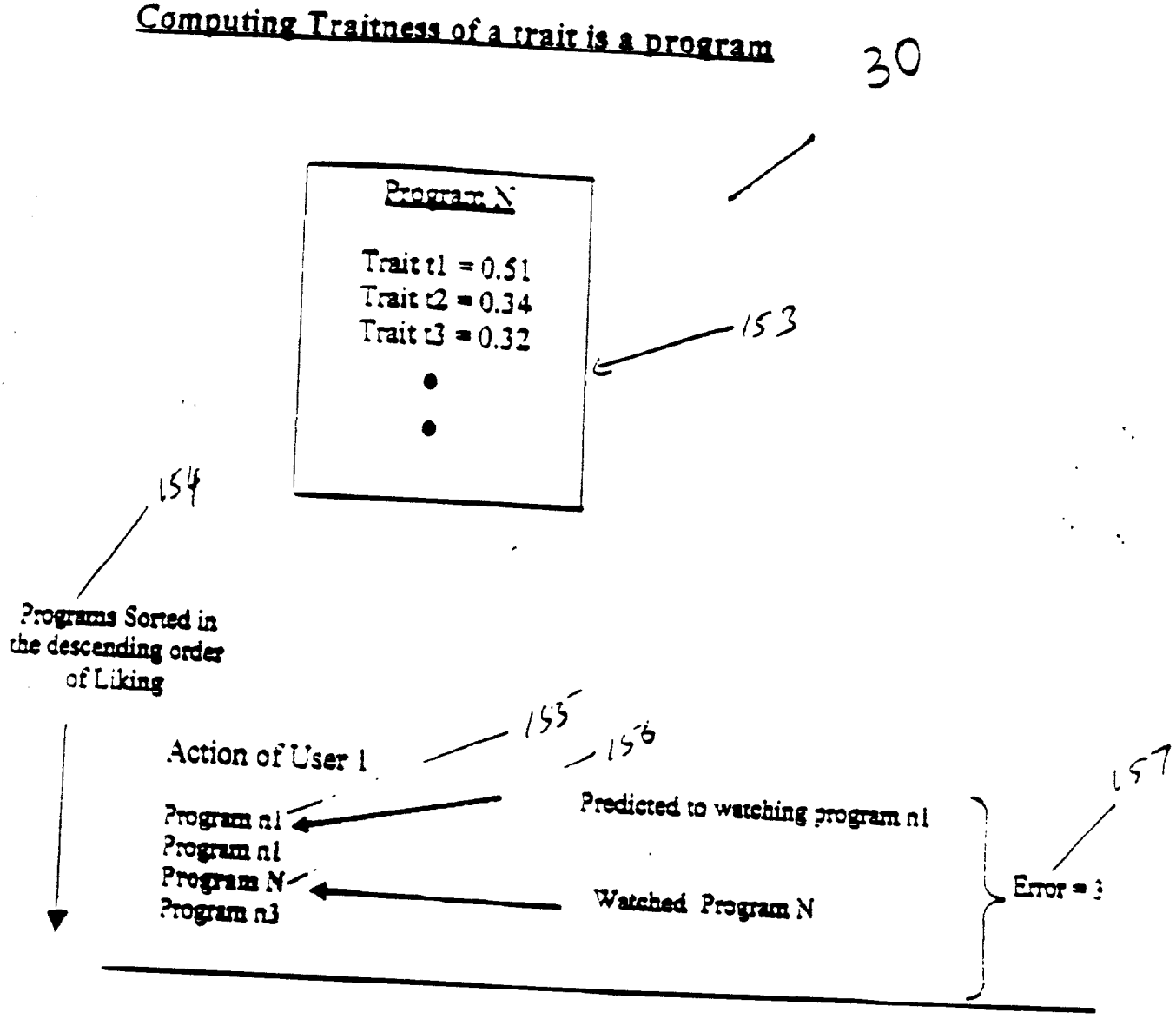

Computing Traitness of a trait is a program
30
Program N
Trait t1 = 0.51
Trait t2 = 0.34
Trait t3 = 0.32
153
154
Programs Sorted in the descending order of Liking
155
156
157
Action of User 1
Program n1
Program n1
Program N
Program n3
Predicted to watching program n1
Watched Program N
Error =

Figure 9(a)

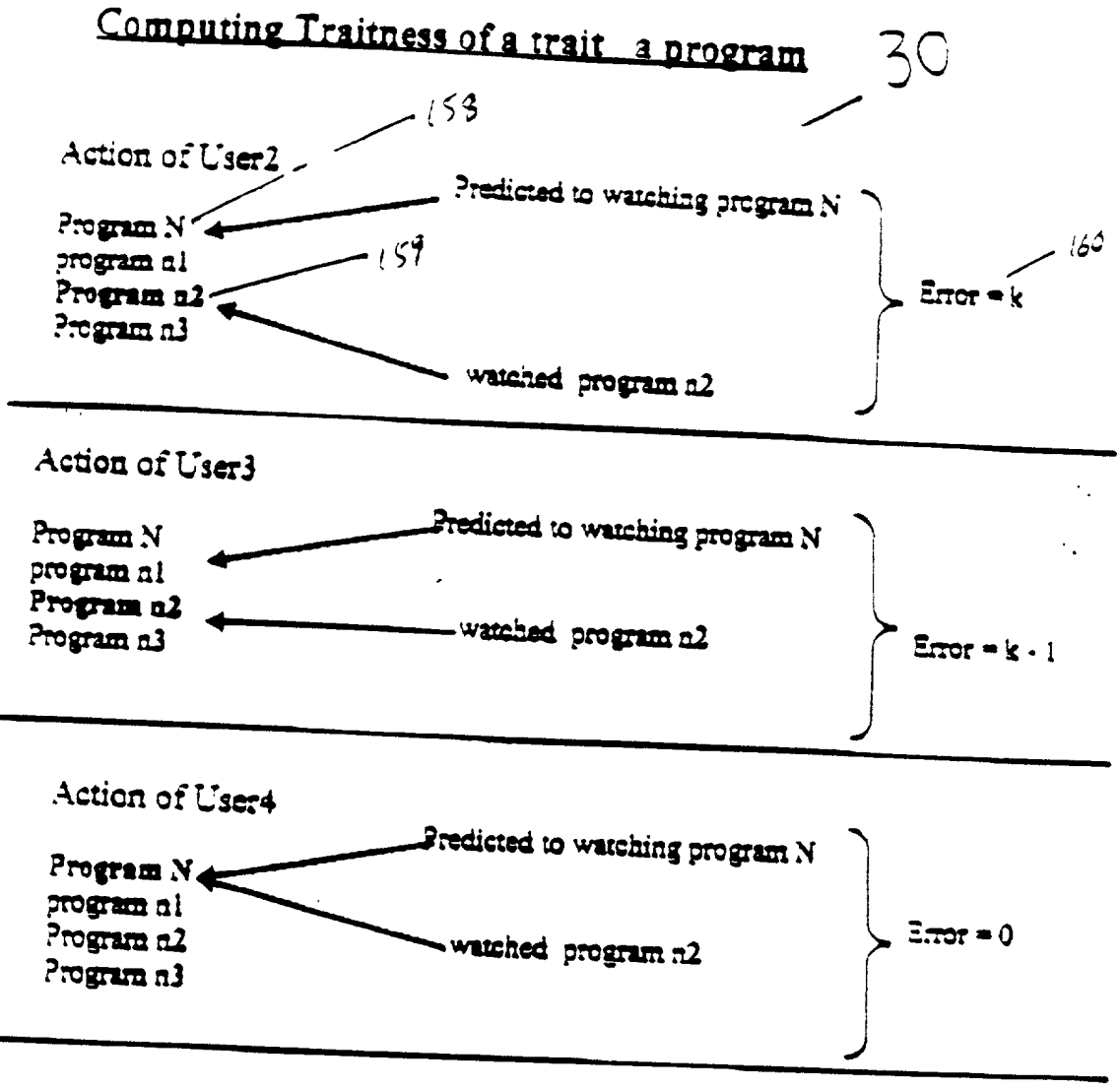
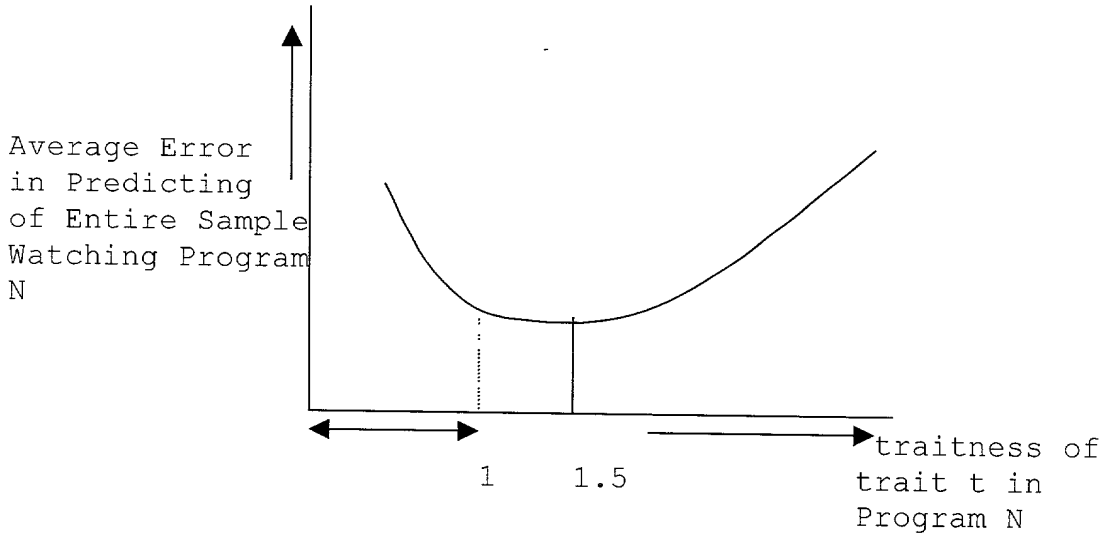

Computing Traitness of a trait a program
30
153
Action of User2
Predicted to watching program N
Program N
program n1
159
Program n2
Program n3
watched program n2
160
Error = k
Action of User3
Program N
program n1
Program n2
Program n3
Predicted to watching program N
watched program n2
Error = k - 1
Action of User4
Program N
program n1
Program n2
Program n3
Predicted to watching program N
watched program n2
Error = 0

Figure 9(b)

Figure 9(c)



Optimal value of traitness

e.g. comedy-ness in Seinfeld = 1.5
comedy-ness in Frasier = 0.89

Example for Liking Distribution Record format

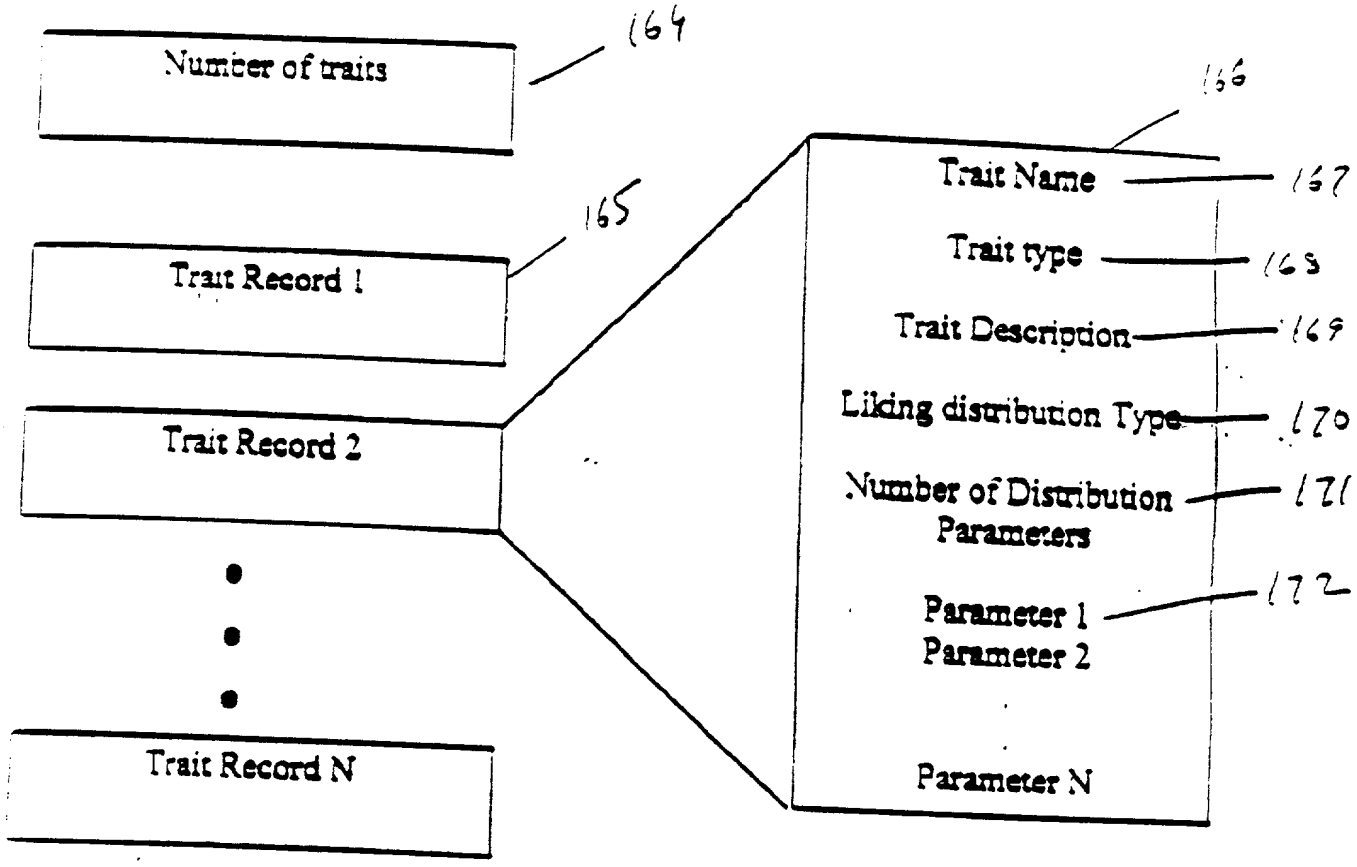


Figure 10

Some Sample Values For Fields in trait Record

Trait type	Trait Description
Static , dynamic Association Generated	(NBC , "NEWS"), SUBSTRING("CLA") IN DESC, TITLE

Distribution	Distribution Parameters
Normal Exponential Defined type 1 Defined type 2	Mean = 13, Deviation =2

Figure 11

Example for Traitness of recurring Programs

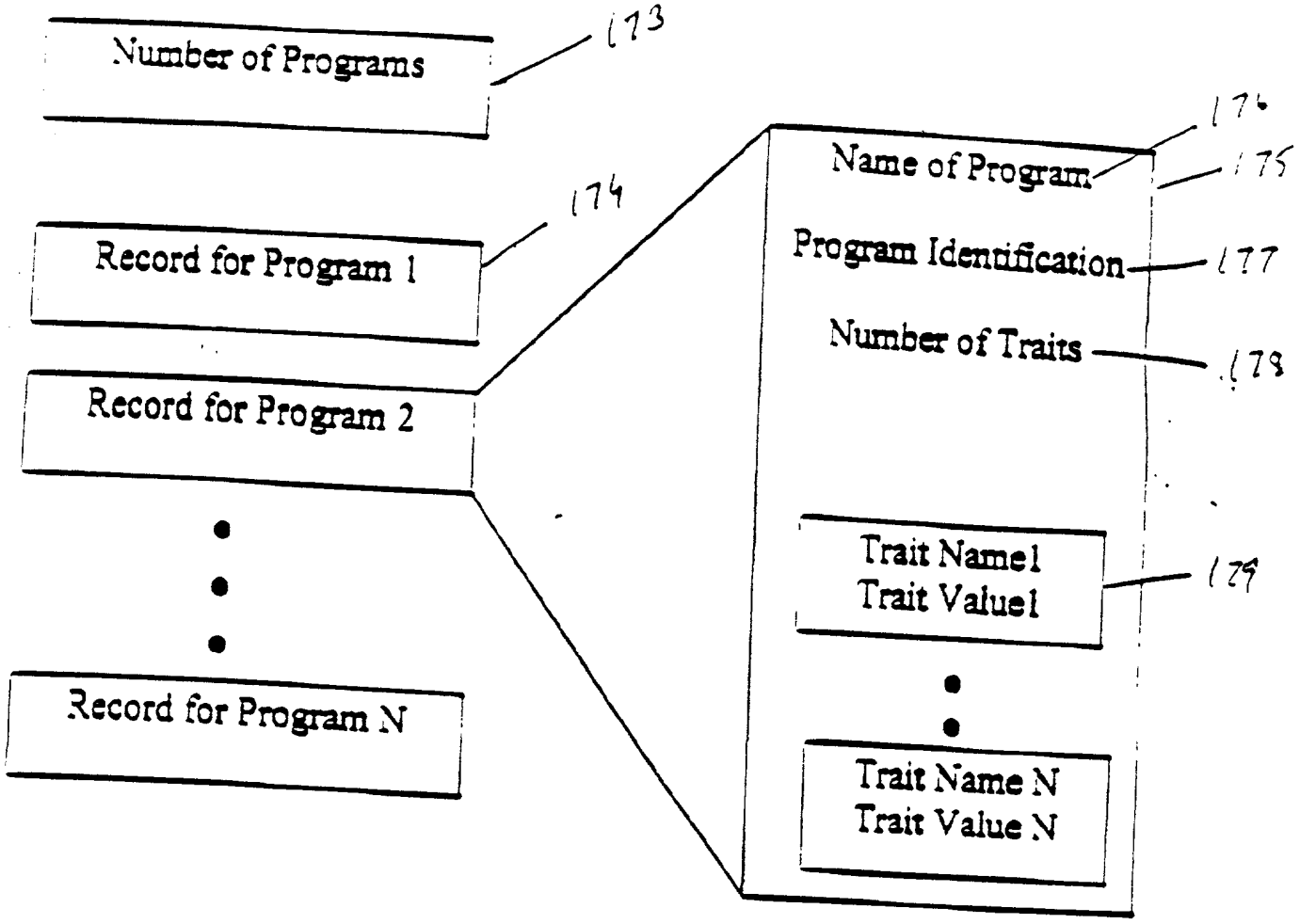


Figure 12

Example For Broadcasting traitness as a part of EPG Data

Program Info
Seinfield,
NBC ,
Comedy = 0.07
sitcom ,
Dynamic trait 1 = 0.1
•
•
Actor = Seinfield

Figure 13

Example for Selection Record

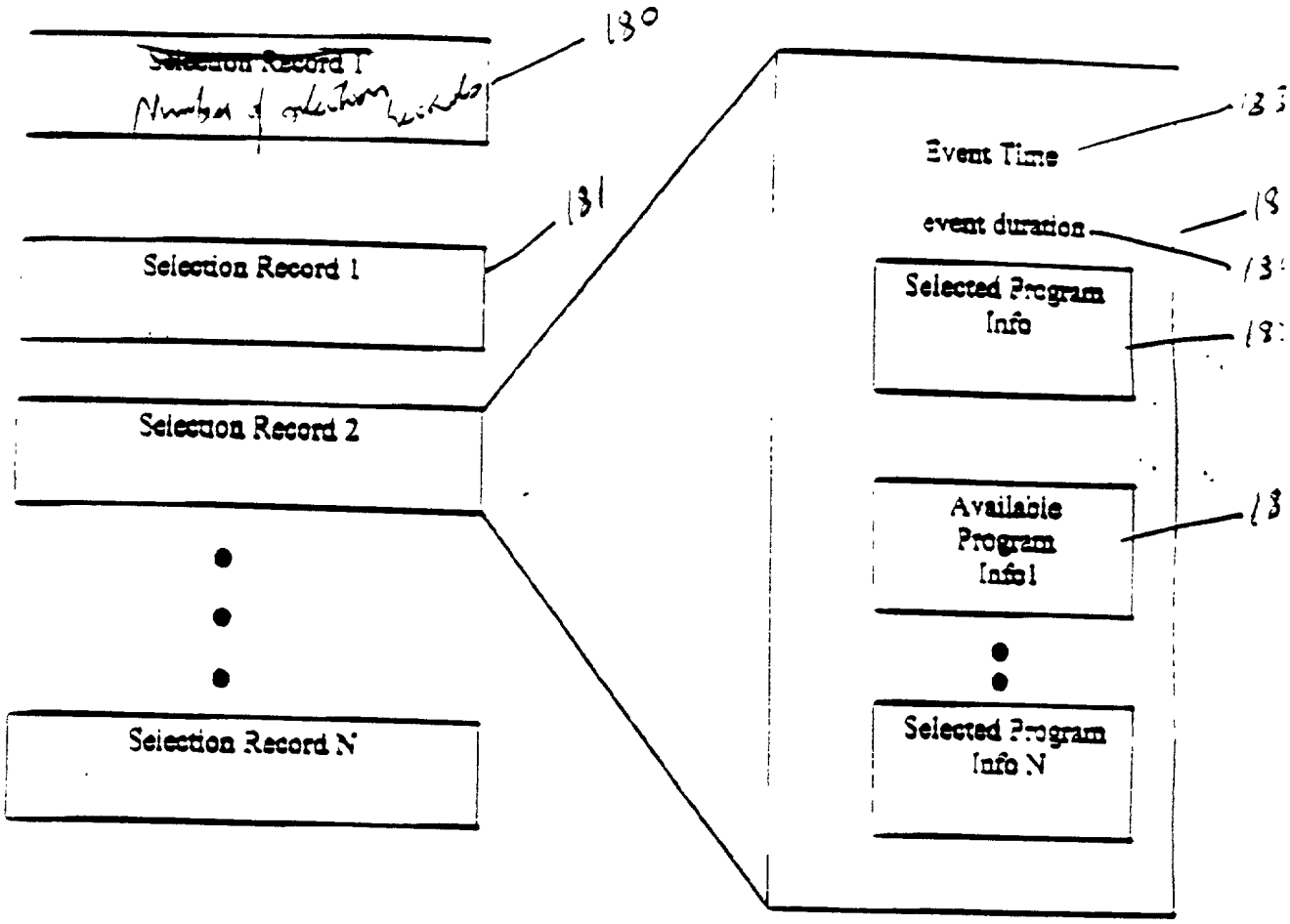


Figure 14

Generation of User Selection History

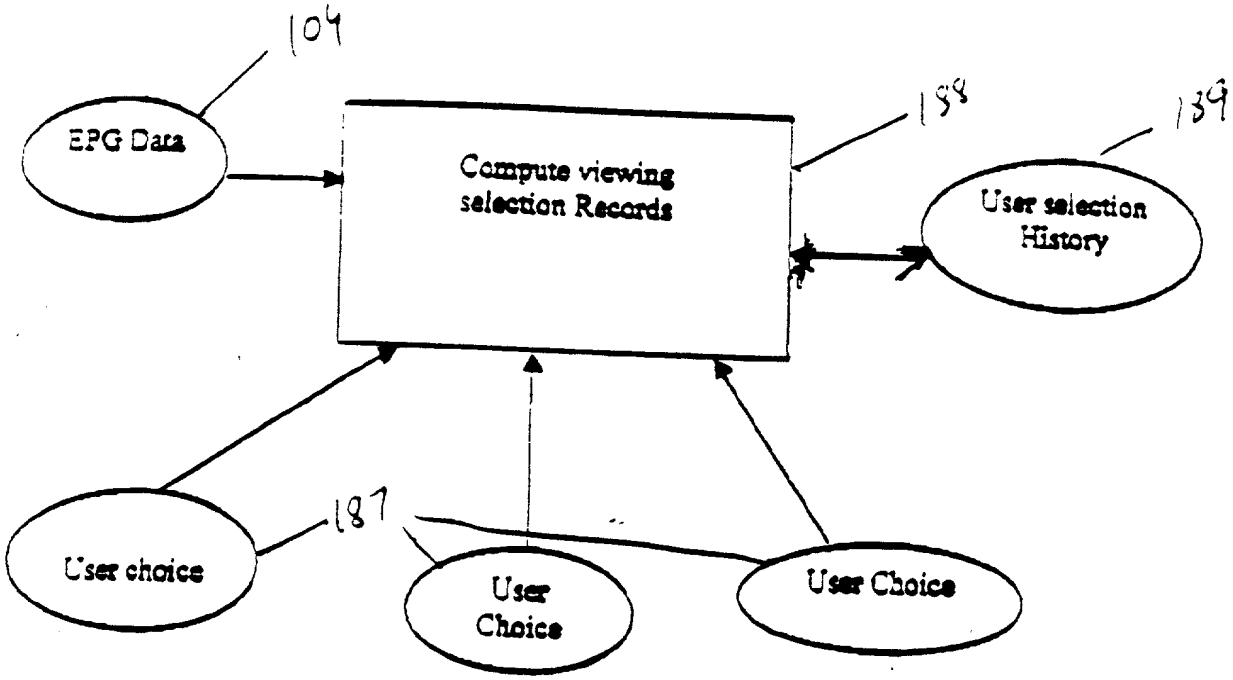


Figure 15

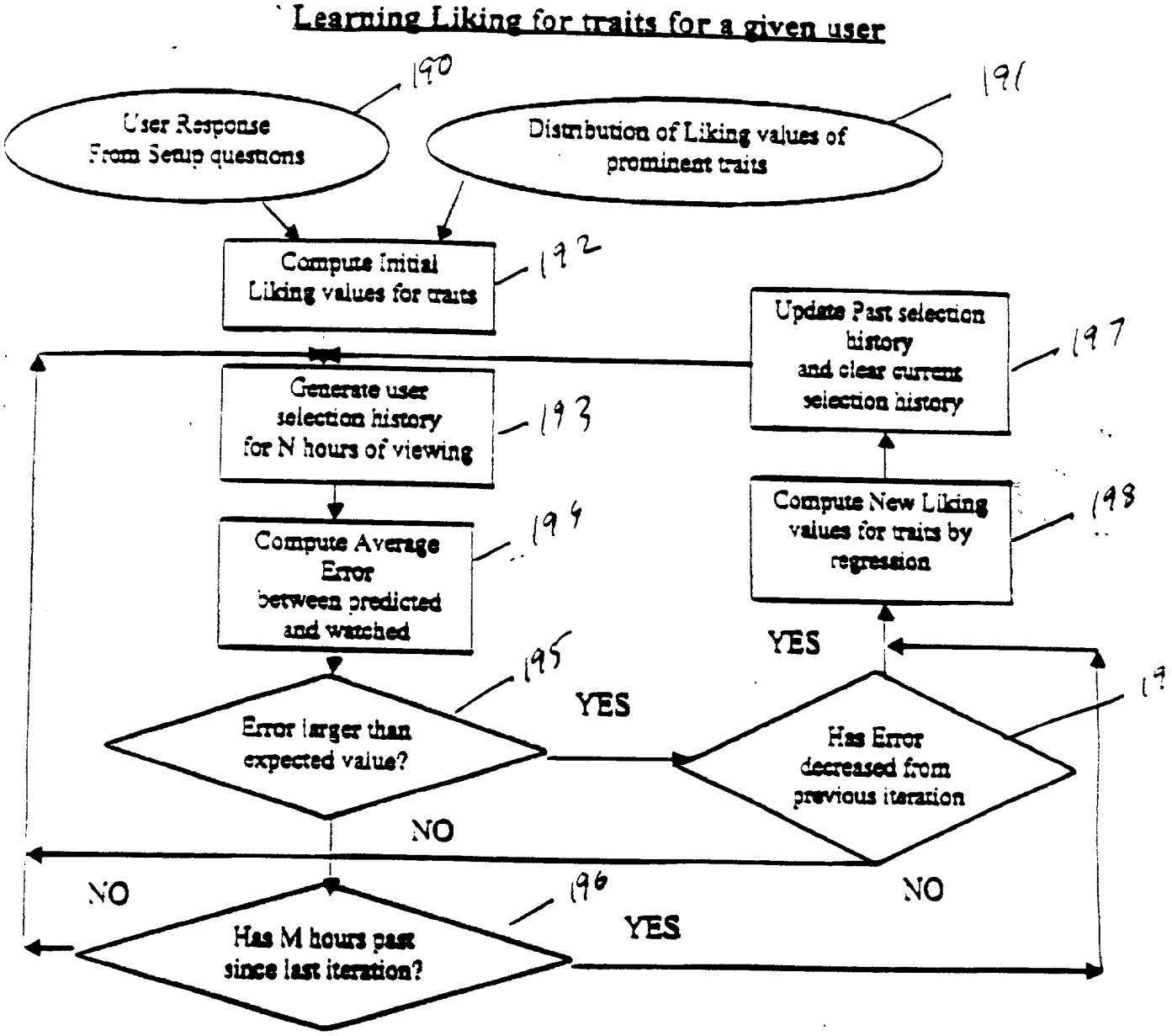

Learning Liking for traits for a given user
User Response From Setup questions
190
Distribution of Liking values of prominent traits
191
Compute Initial Liking values for traits
192
Generate user selection history for N hours of viewing
193
Compute Average Error between predicted and watched
194
Error larger than expected value?
195
YES
NO
Has M hours past since last iteration?
196
NO
YES
Has Error decreased from previous iteration
YES
NO
Compute New Liking values for traits by regression
198
Update Past selection history and clear current selection history
197

Figure 16

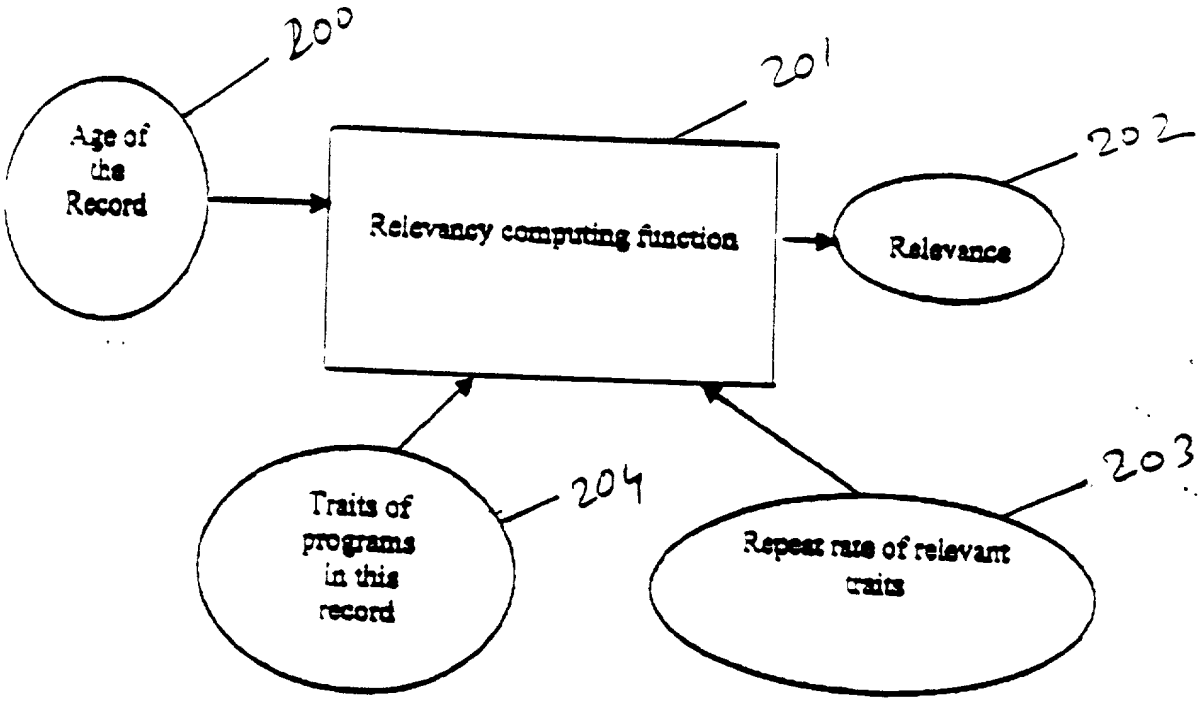

Computing Relevance
200
Age of the Record
201
Relevancy computing function
202
Relevance
204
Traits of programs in this record
203
Repeat rate of relevant traits

Figure 17 (a)

Figure 17(b)

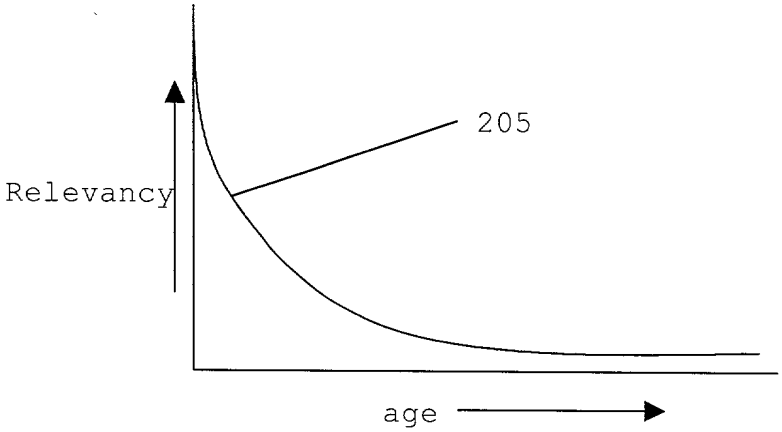
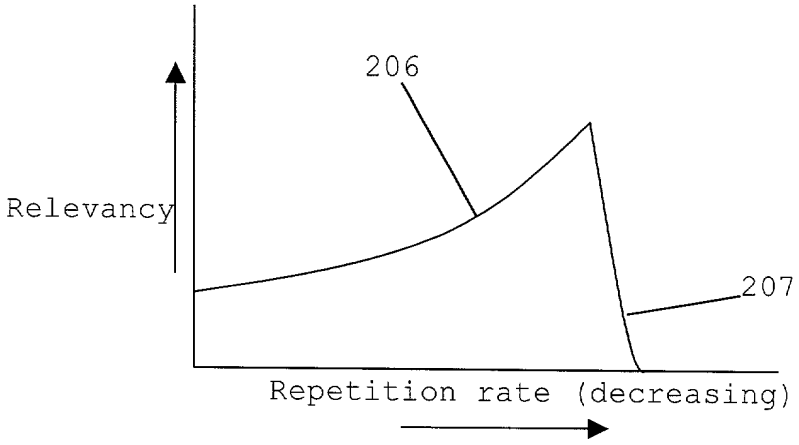


Figure 17(c)



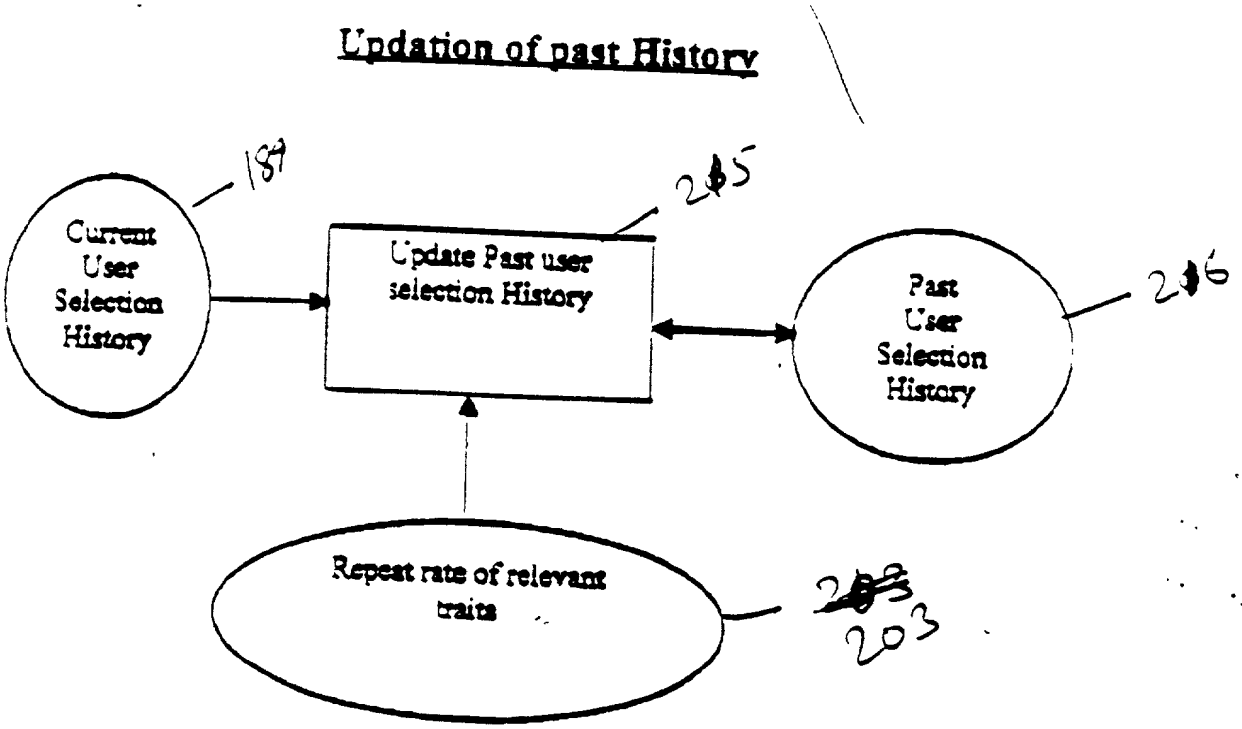

Updation of past History
Current User Selection History
Update Past user selection History
Past User Selection History
Repeat rate of relevant traits
184
205
206
203

Figure 18(a)

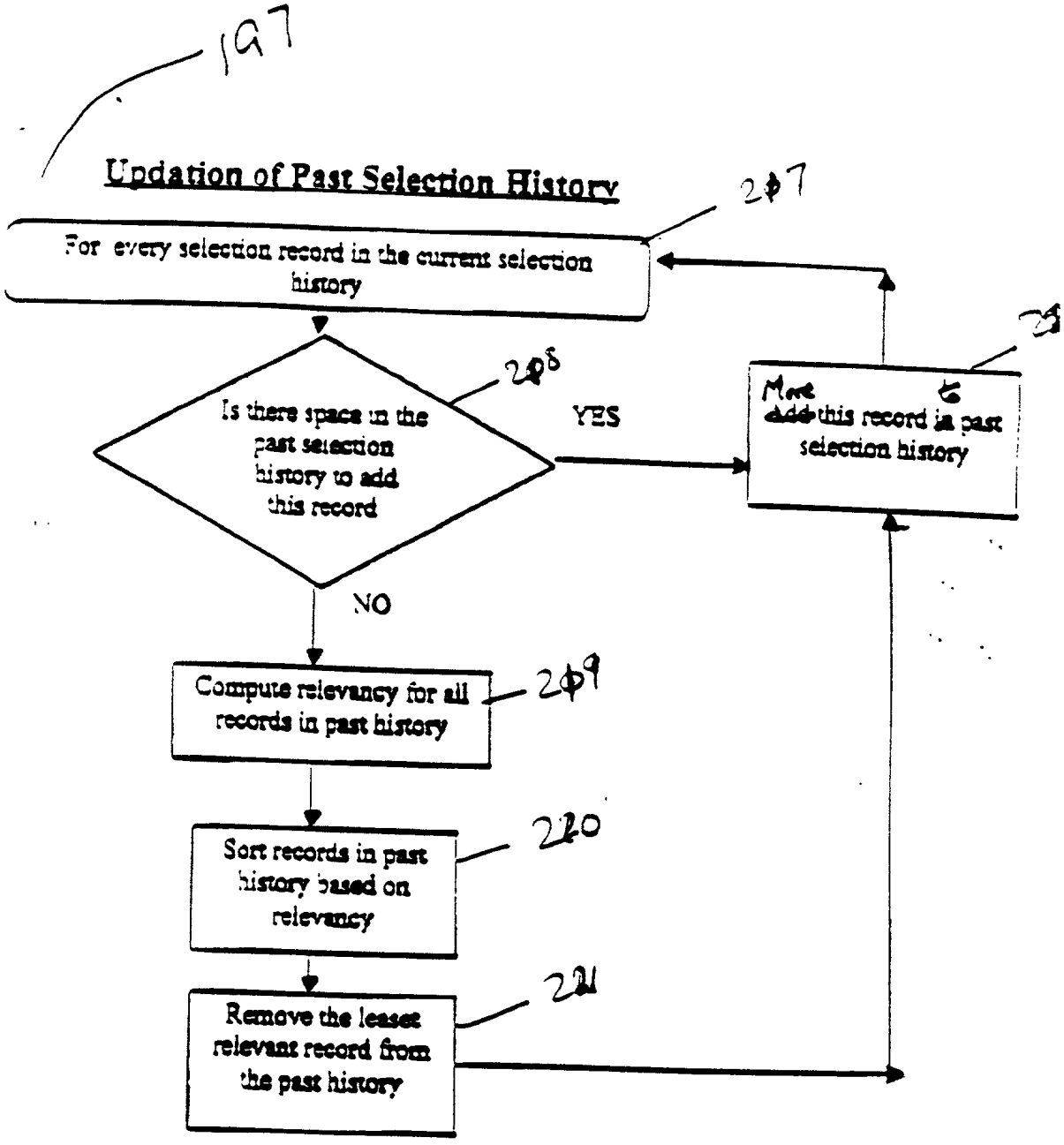

197
Updation of Past Selection History
207
For every selection record in the current selection history
208
Is there space in the past selection history to add this record
YES
NO
More
this record in past selection history
Compute relevancy for all records in past history
209
Sort records in past history based on relevancy
220
Remove the leaset relevant record from the past history
221

Figure 18(b)

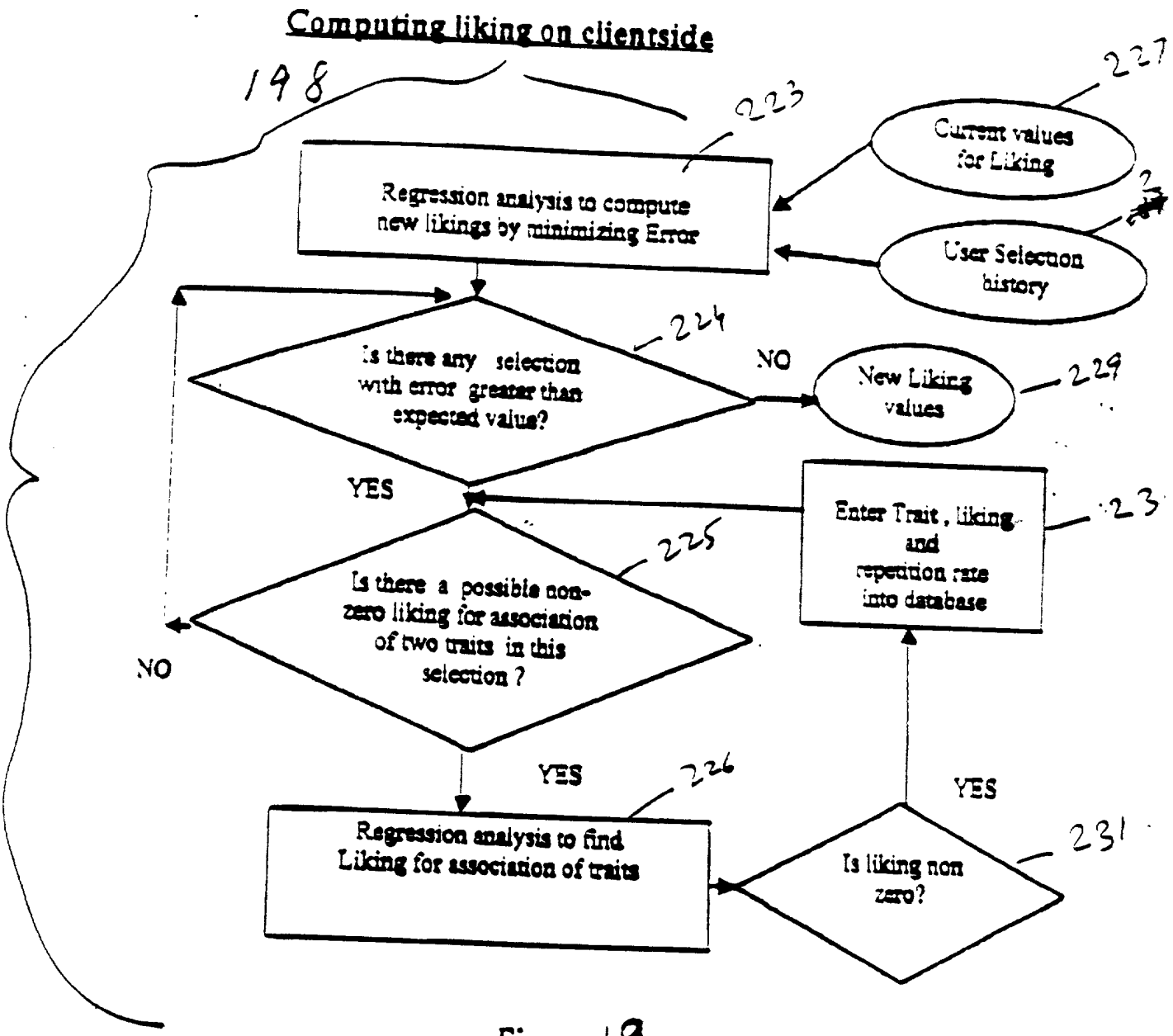

Computing liking on clientside
198
223
227
Current values for Liking
Regression analysis to compute new likings by minimizing Error
User Selection history
224
Is there any selection with error greater than expected value?
NO
New Liking values
229
YES
Enter Trait, liking and repetition rate into database
225
Is there a possible non-zero liking for association of two traits in this selection ?
NO
YES
226
YES
Regression analysis to find Liking for association of traits
Is liking non zero?
231

Figure 19

Computing scores for programs for future prediction

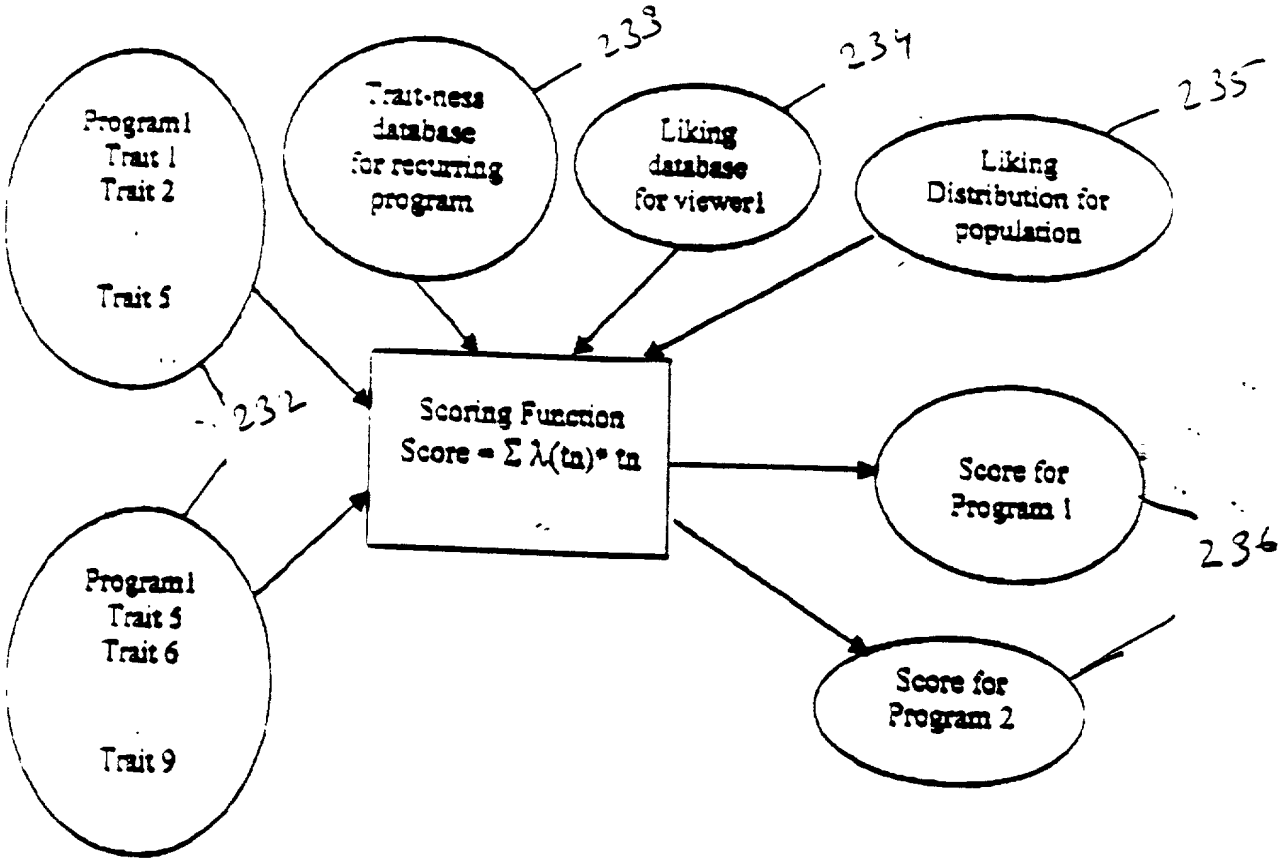
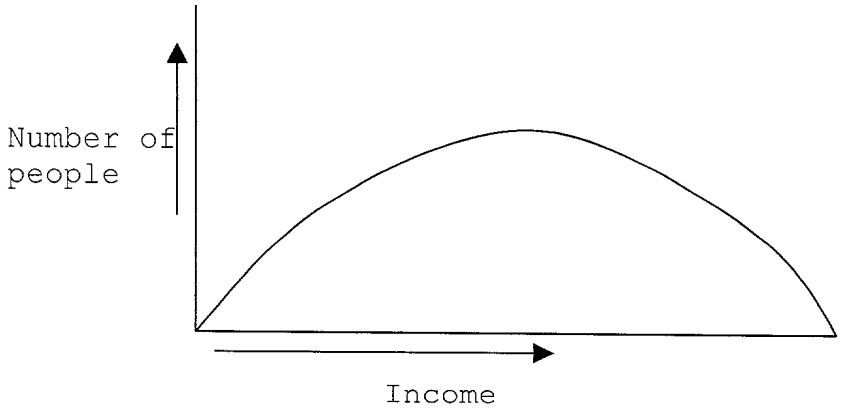
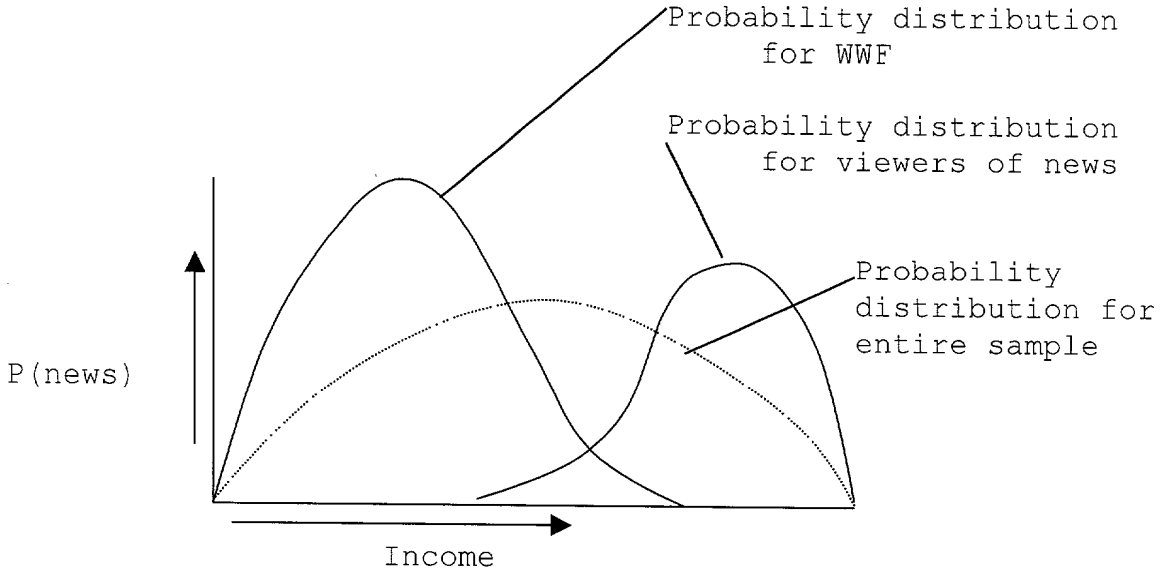


Figure 20

Figure 21(a)

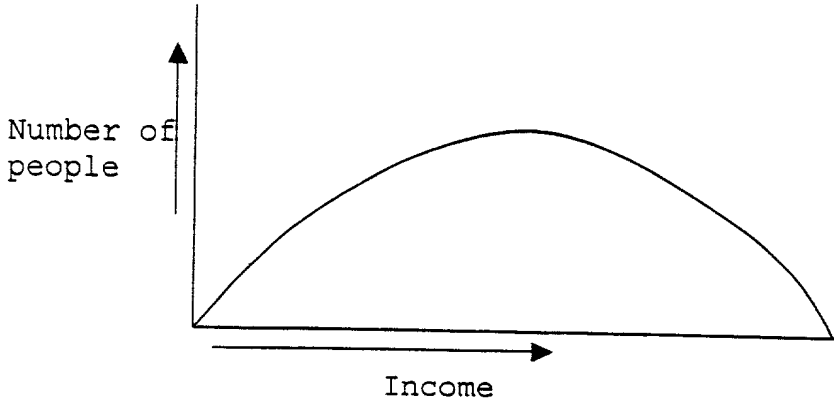


(i)

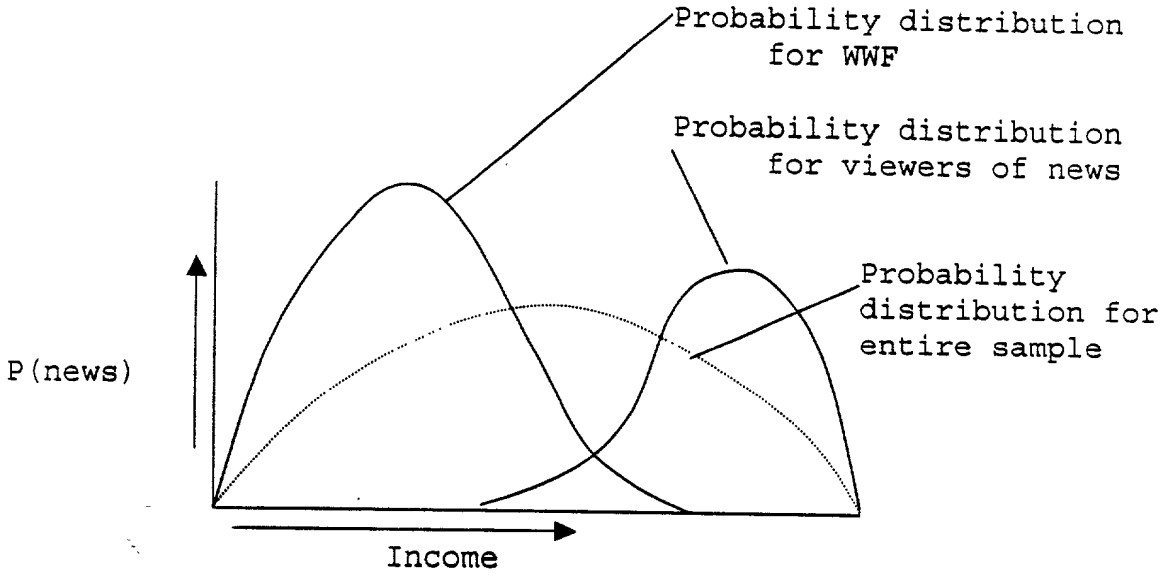


(ii)

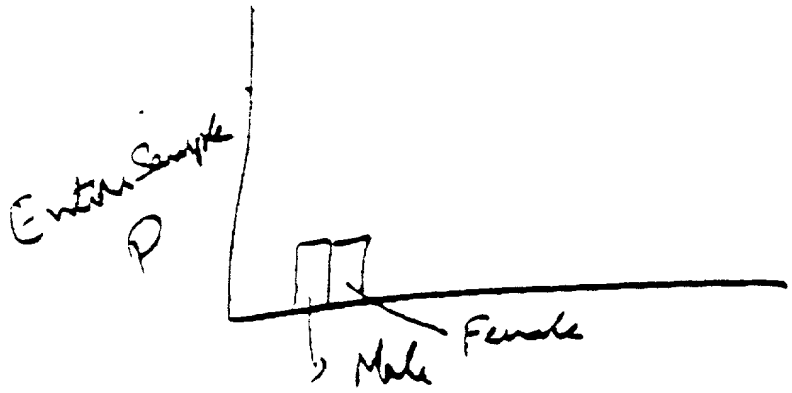
Figure 21(a)

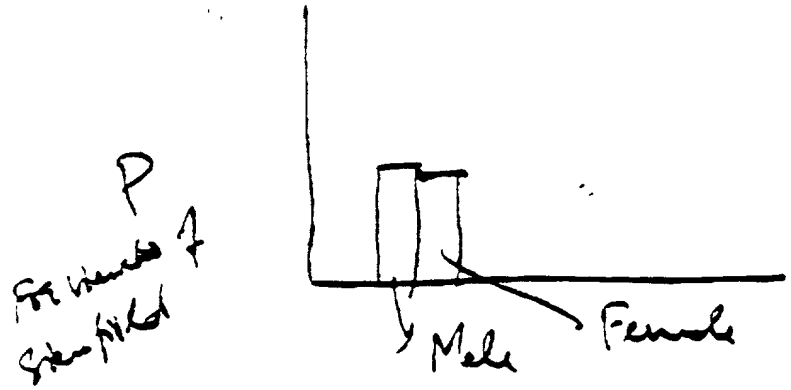


(i)



(ii)


Entire Sample
P
Female
Male


P
for females if
stratified
Male
Female

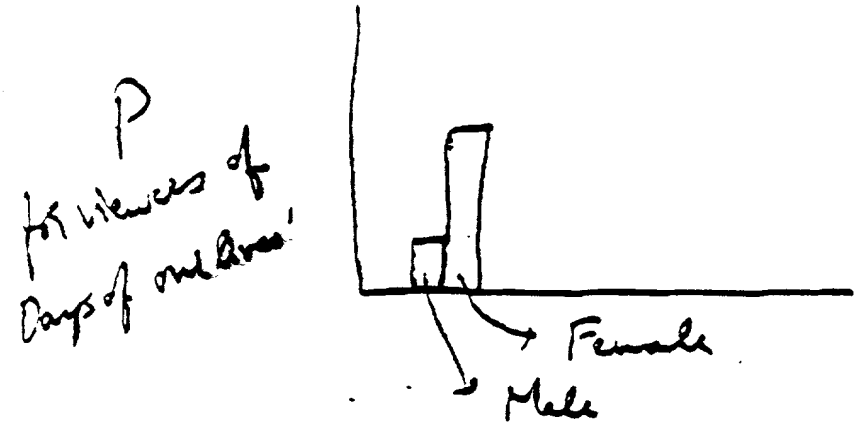

P
for likelihood of
Drop of out/Loss
Female
Male

FIGURE 21b

System Architecture

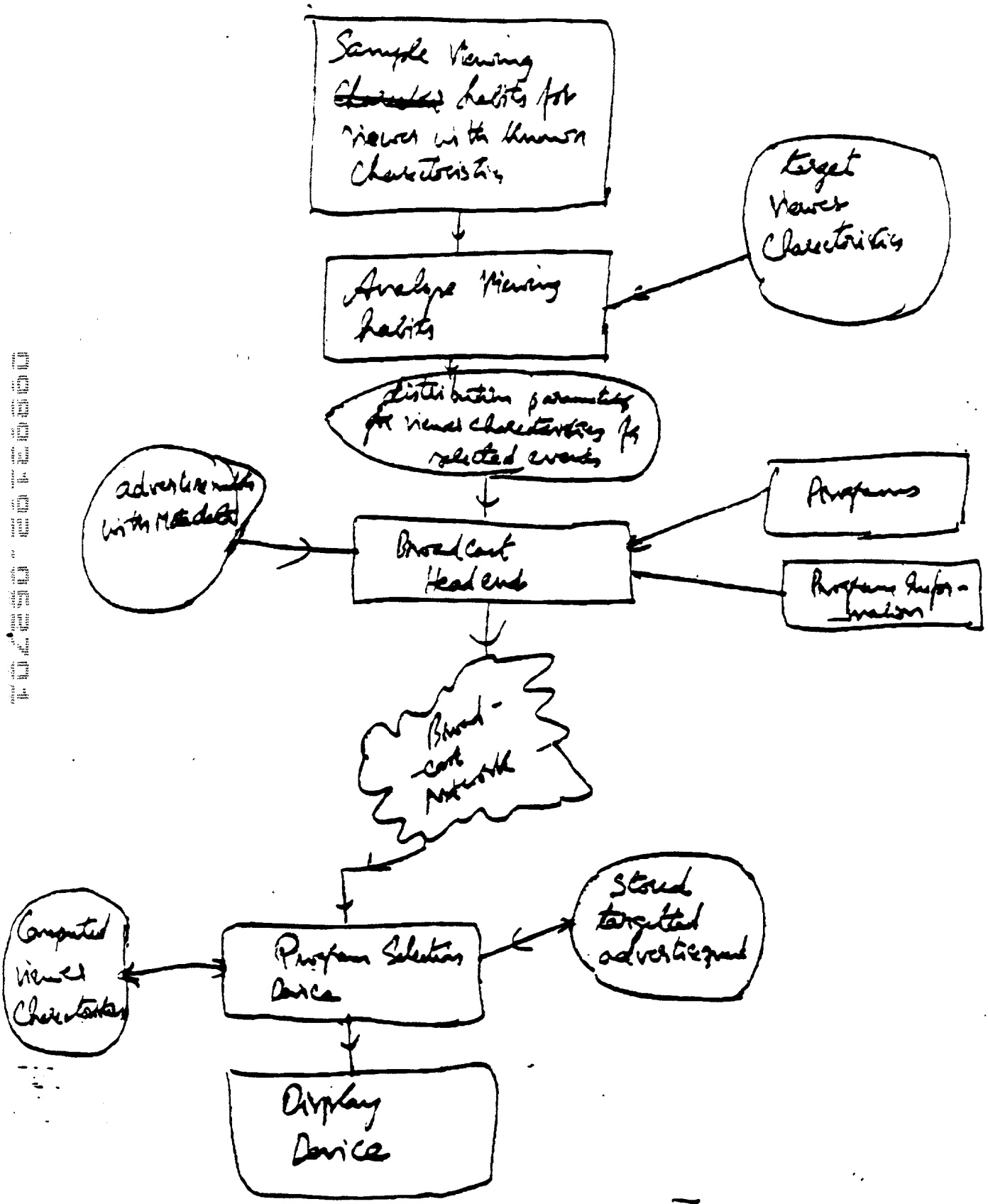


FIGURE 22

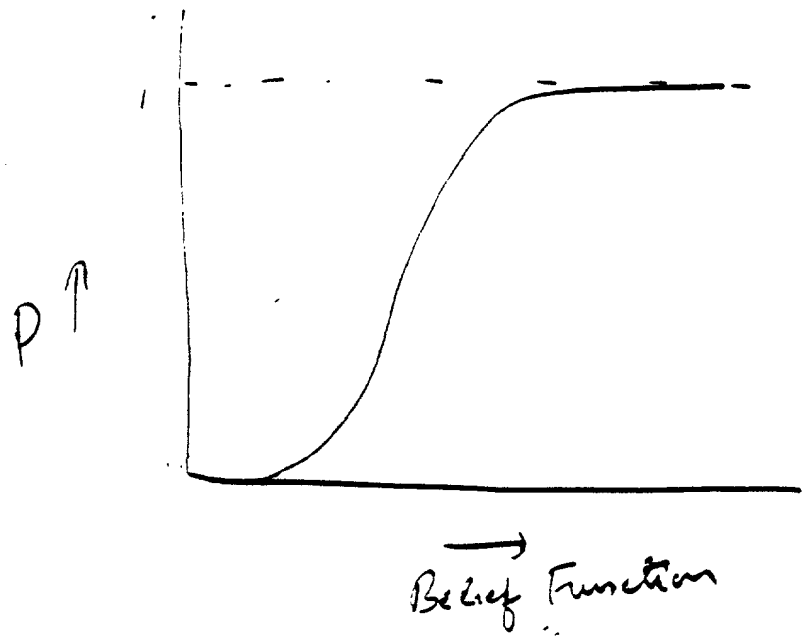


Figure 23a

Demographic Trait Record format

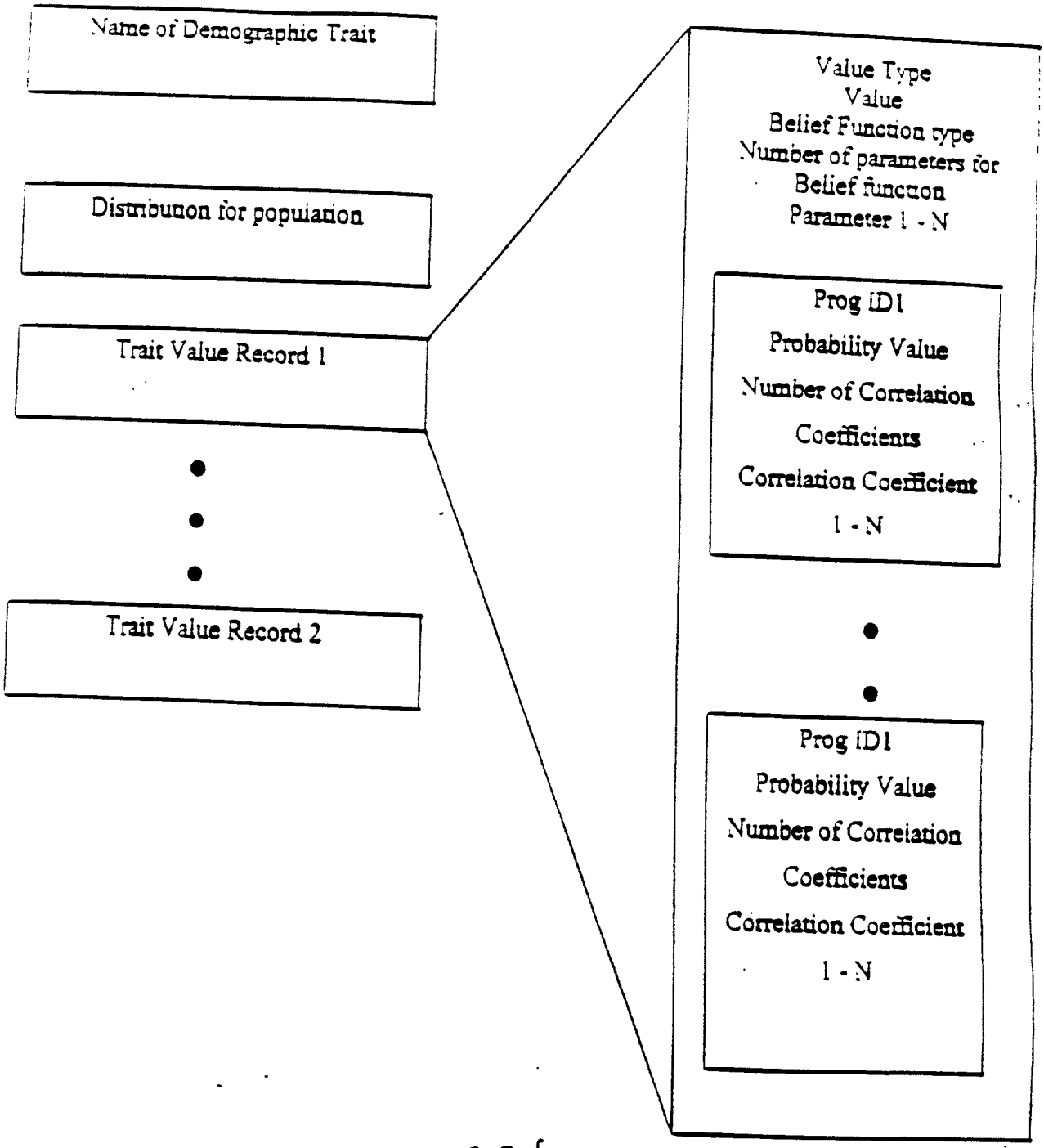


Figure 23b

Advertisement Targeting Record format

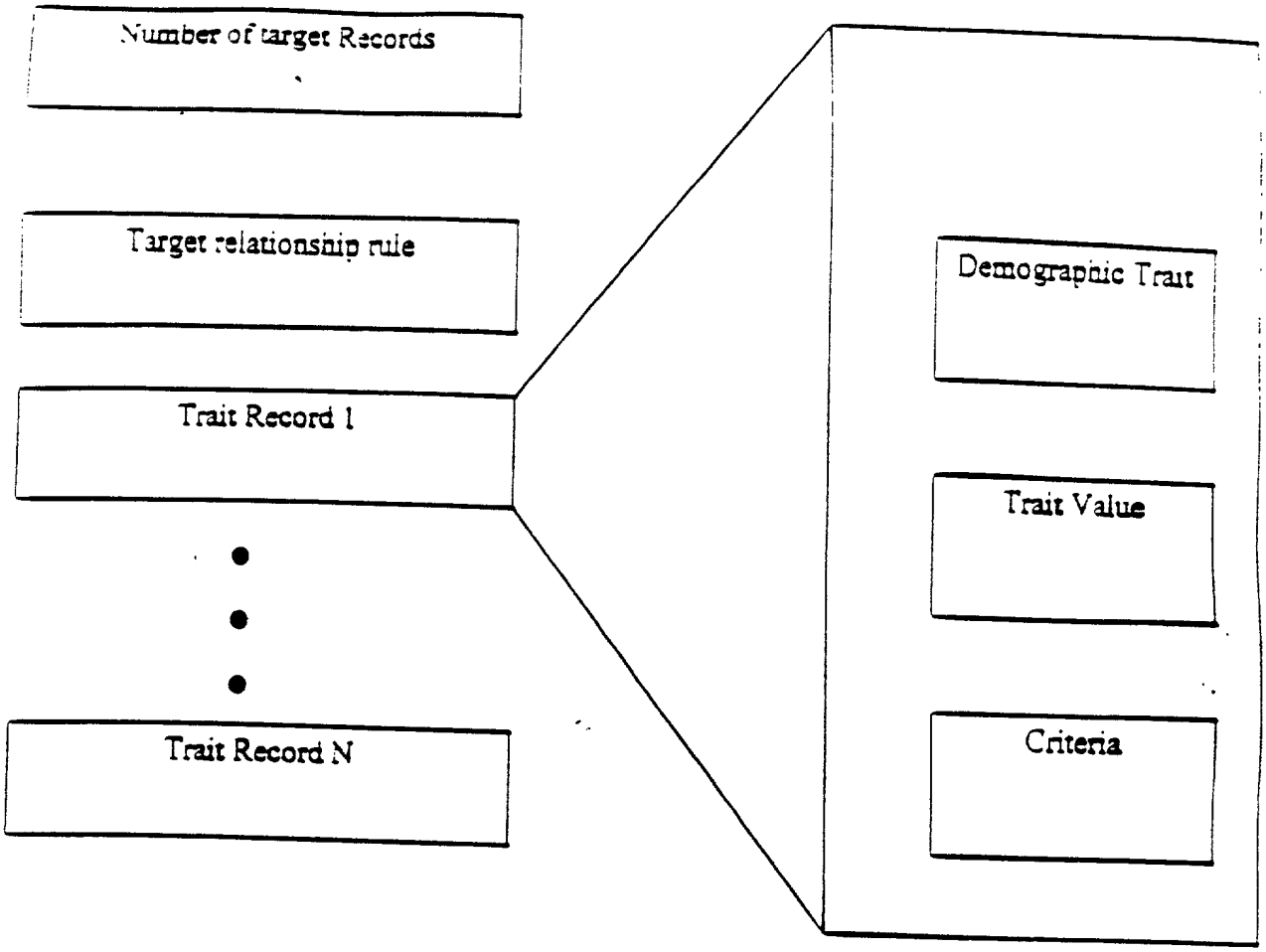


Figure 23c

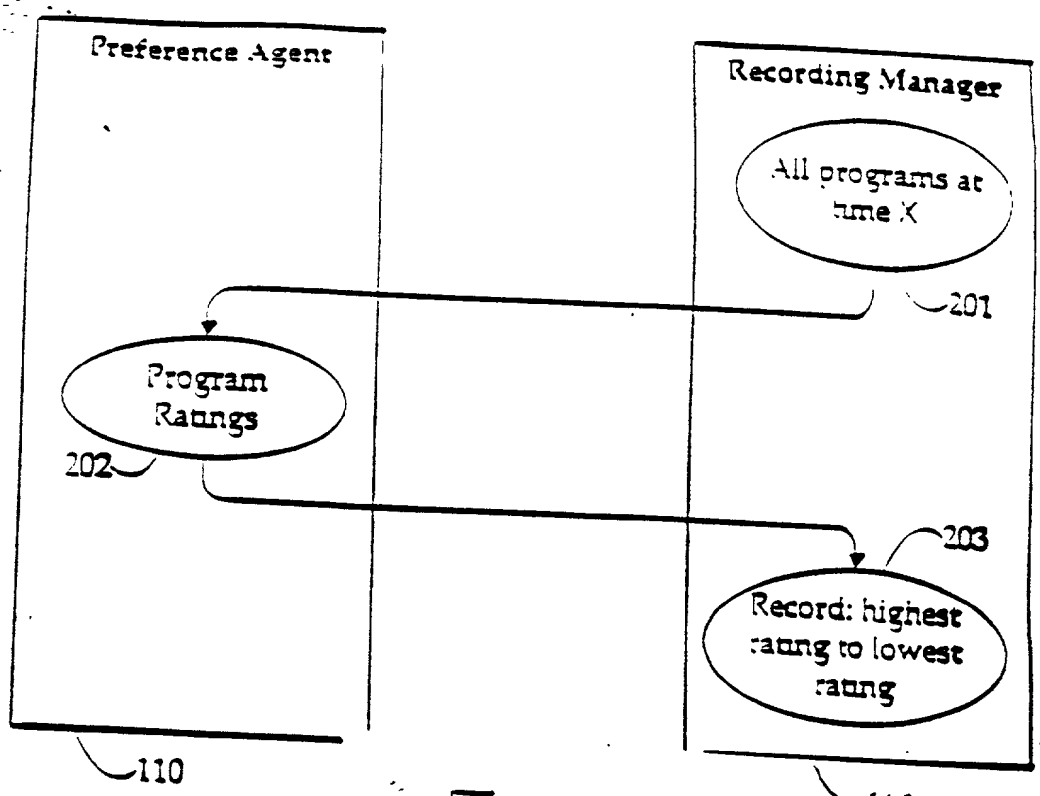


Figure 24

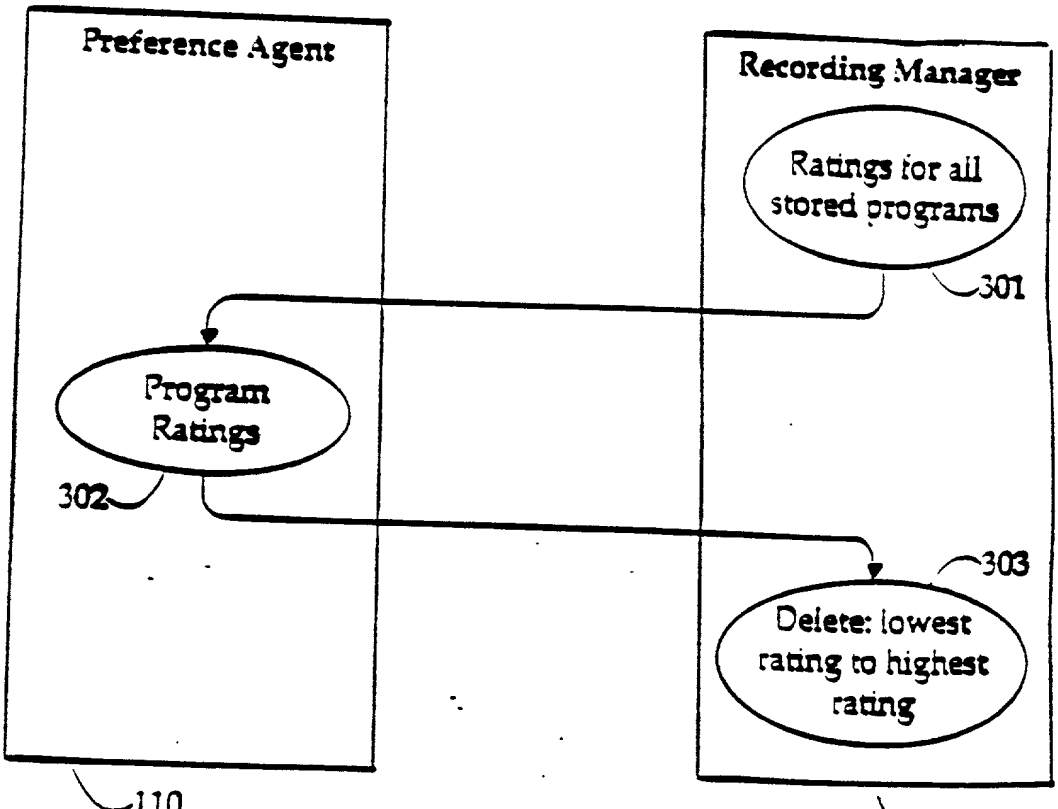


Figure 25

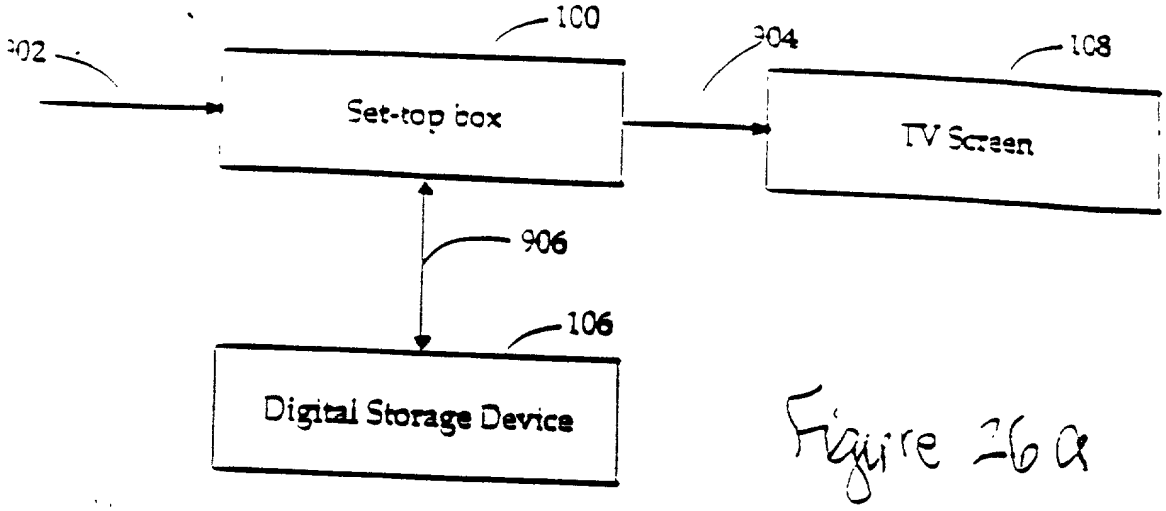


Figure 26a

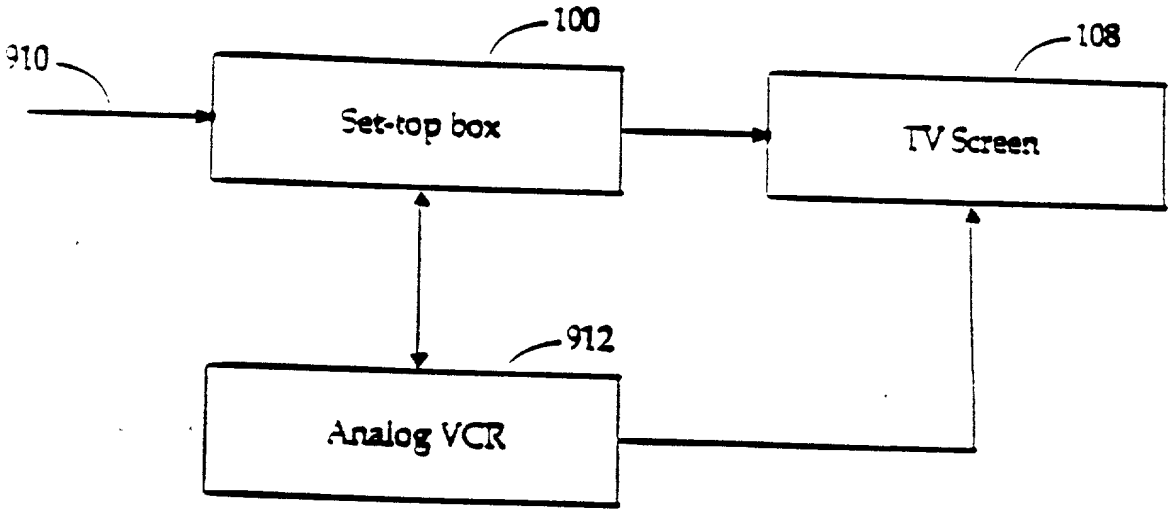


Figure 26b

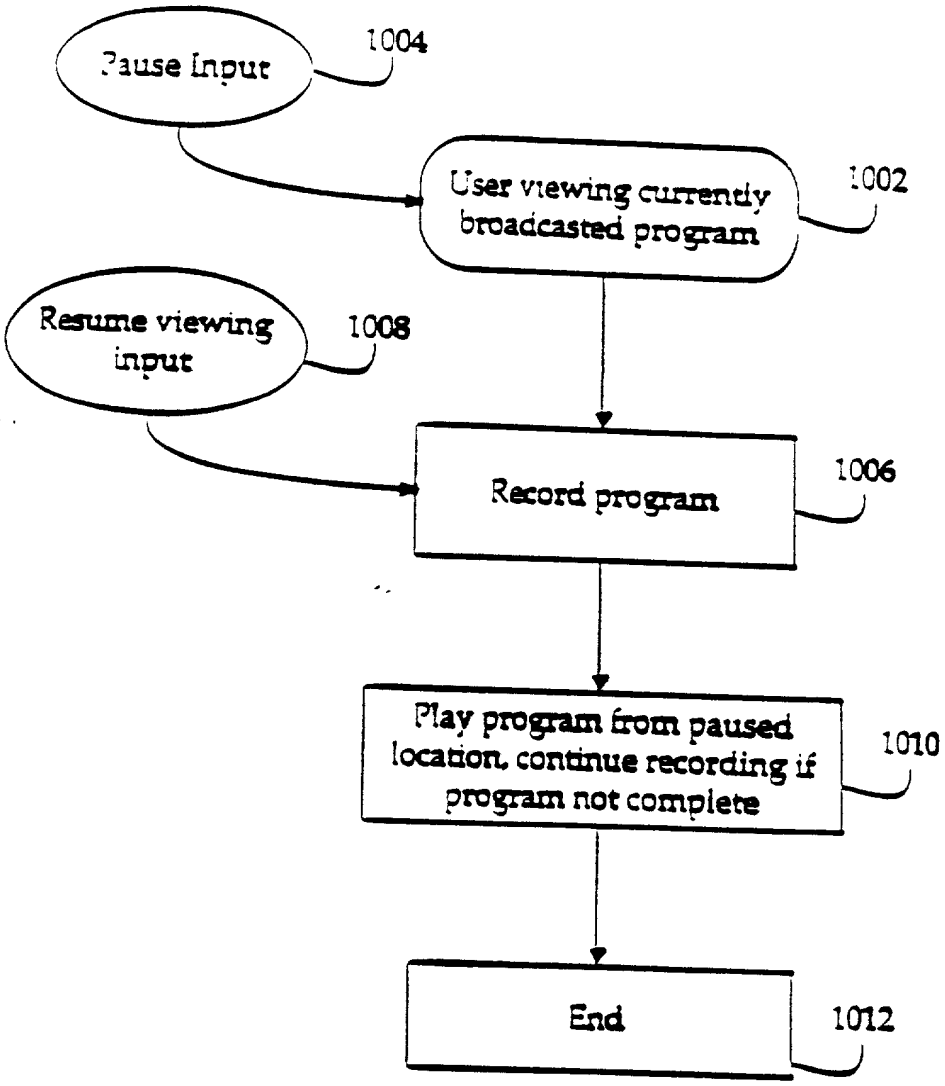

Pause Input
1004
User viewing currently broadcasted program
1002
Resume viewing input
1008
Record program
1006
Play program from paused location, continue recording if program not complete
1010
End
1012

Figure 27

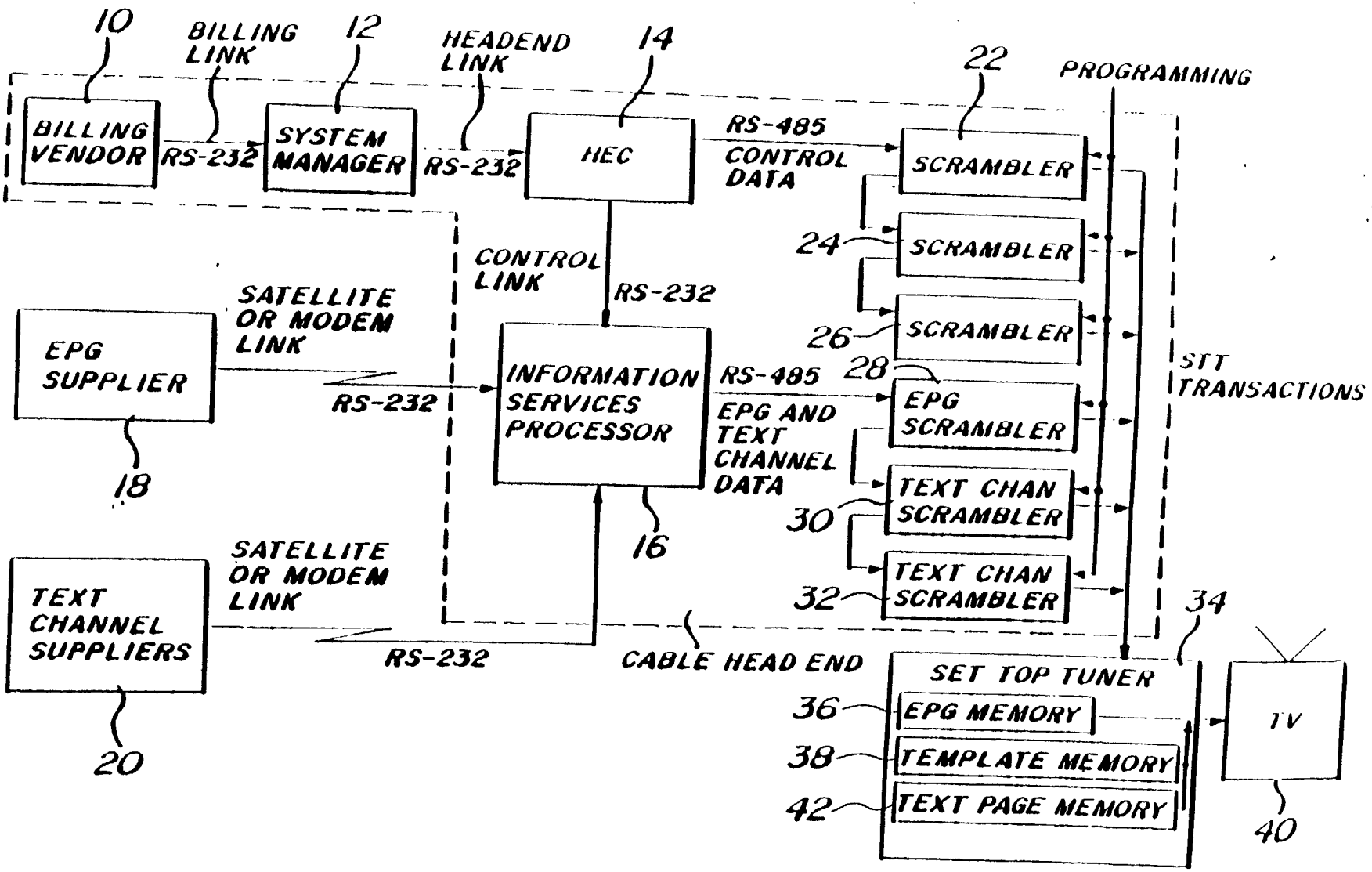

10
BILLING VENDOR
BILLING LINK
RS-232
12
SYSTEM MANAGER
HEADEND LINK
RS-232
14
HEC
RS-485 CONTROL DATA
22
SCRAMBLER
PROGRAMMING
24
SCRAMBLER
26
SCRAMBLER
28
EPG SCRAMBLER
TEXT CHAN SCRAMBLER
30
TEXT CHAN SCRAMBLER
32
STT TRANSACTIONS
CONTROL LINK
RS-232
SATELLITE OR MODEM LINK
EPG SUPPLIER
RS-232
18
INFORMATION SERVICES PROCESSOR
RS-485
EPG AND TEXT CHANNEL DATA
16
SATELLITE OR MODEM LINK
TEXT CHANNEL SUPPLIERS
RS-232
20
CABLE HEAD END
34
SET TOP TUNER
36
EPG MEMORY
38
TEMPLATE MEMORY
42
TEXT PAGE MEMORY
TV
40

Figure 28

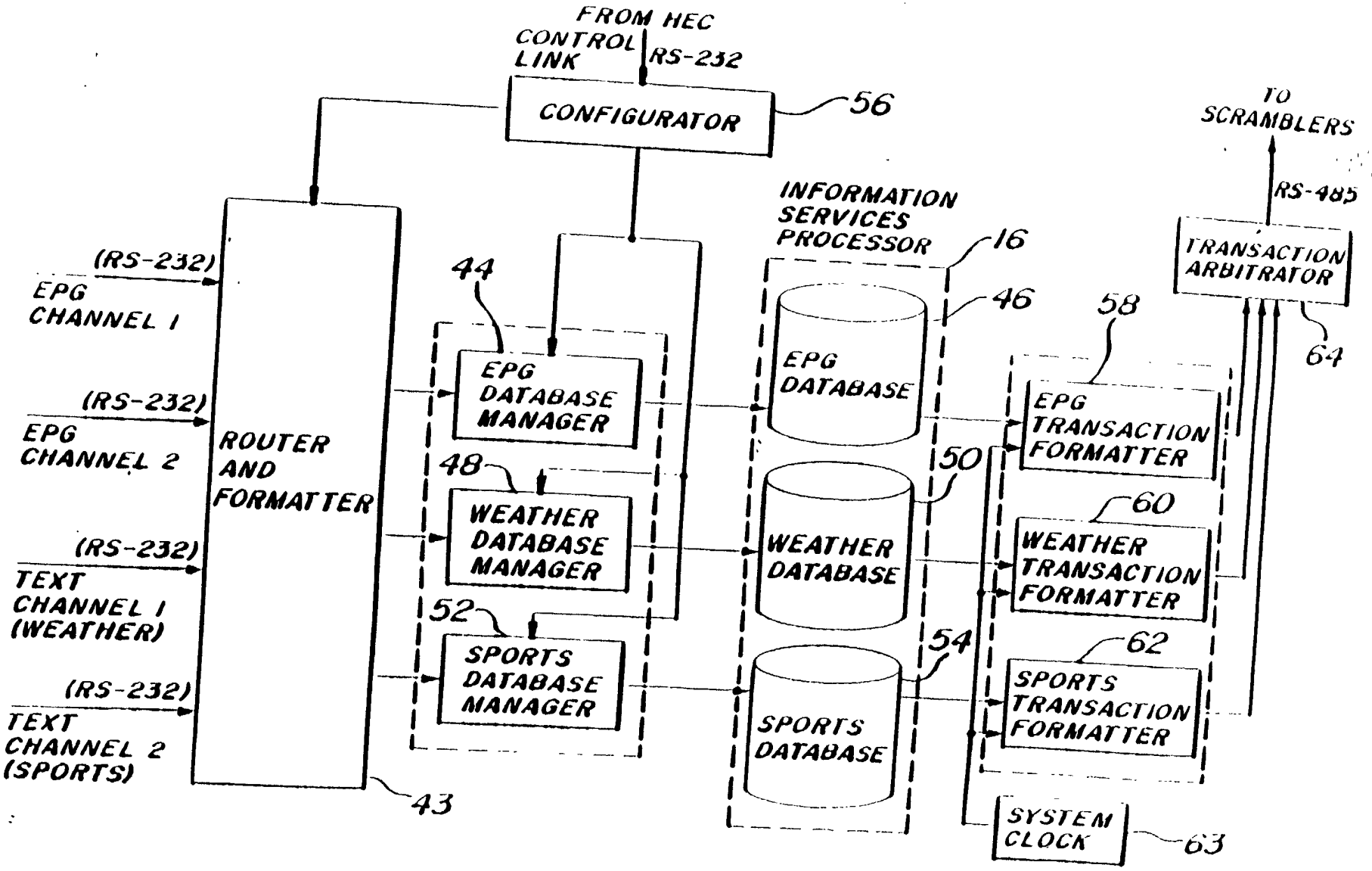

FROM HEC
CONTROL LINK
RS-232
CONFIGURATOR
56
TO SCRAMBLERS
RS-485
INFORMATION SERVICES PROCESSOR
16
TRANSACTION ARBITRATOR
64
(RS-232)
EPG CHANNEL 1
(RS-232)
EPG CHANNEL 2
(RS-232)
TEXT CHANNEL 1 (WEATHER)
(RS-232)
TEXT CHANNEL 2 (SPORTS)
ROUTER AND FORMATTER
43
44
EPG DATABASE MANAGER
48
WEATHER DATABASE MANAGER
52
SPORTS DATABASE MANAGER
46
EPG DATABASE
50
WEATHER DATABASE
54
SPORTS DATABASE
58
EPG TRANSACTION FORMATTER
60
WEATHER TRANSACTION FORMATTER
62
SPORTS TRANSACTION FORMATTER
SYSTEM CLOCK
63

Figure 29

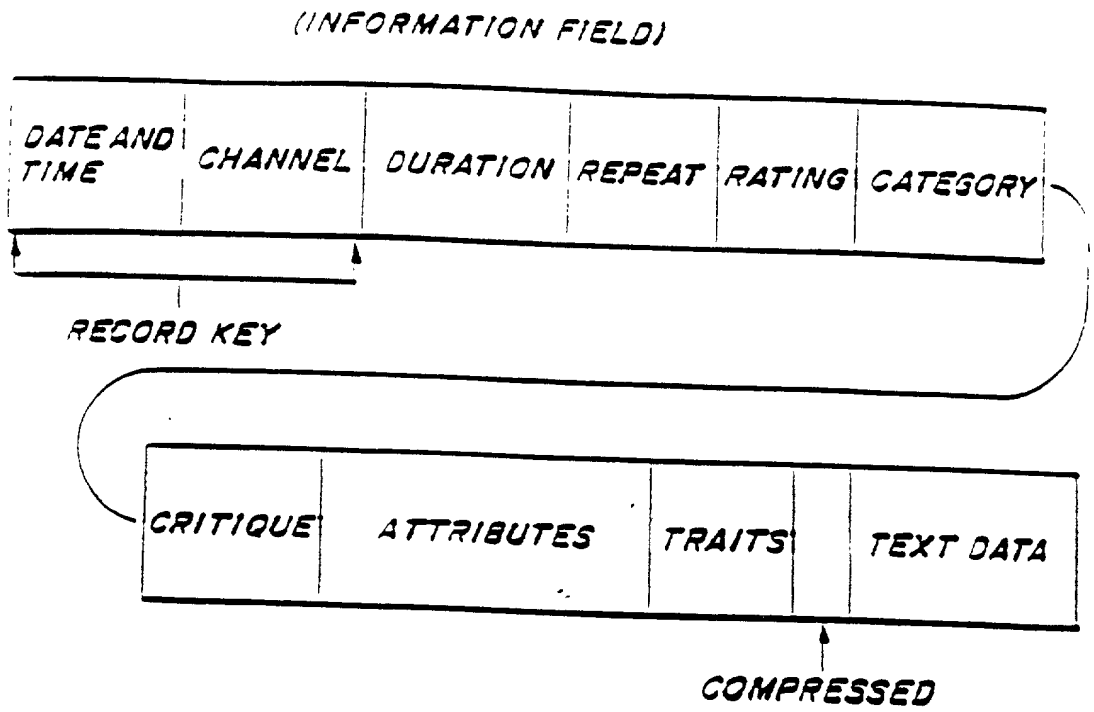


Figure 30

(TO SCRAMBLERS)

BEGINNING FLAG 1 BYTE	STATION ADDRESS 1 BYTE	CONTROL 1 BYTE	INFOR-MATION FIELD n BYTES	FRAME CHECK 2 BYTES	ENDING

Figure 31

EPG TRANSACTION FORMATTER 58

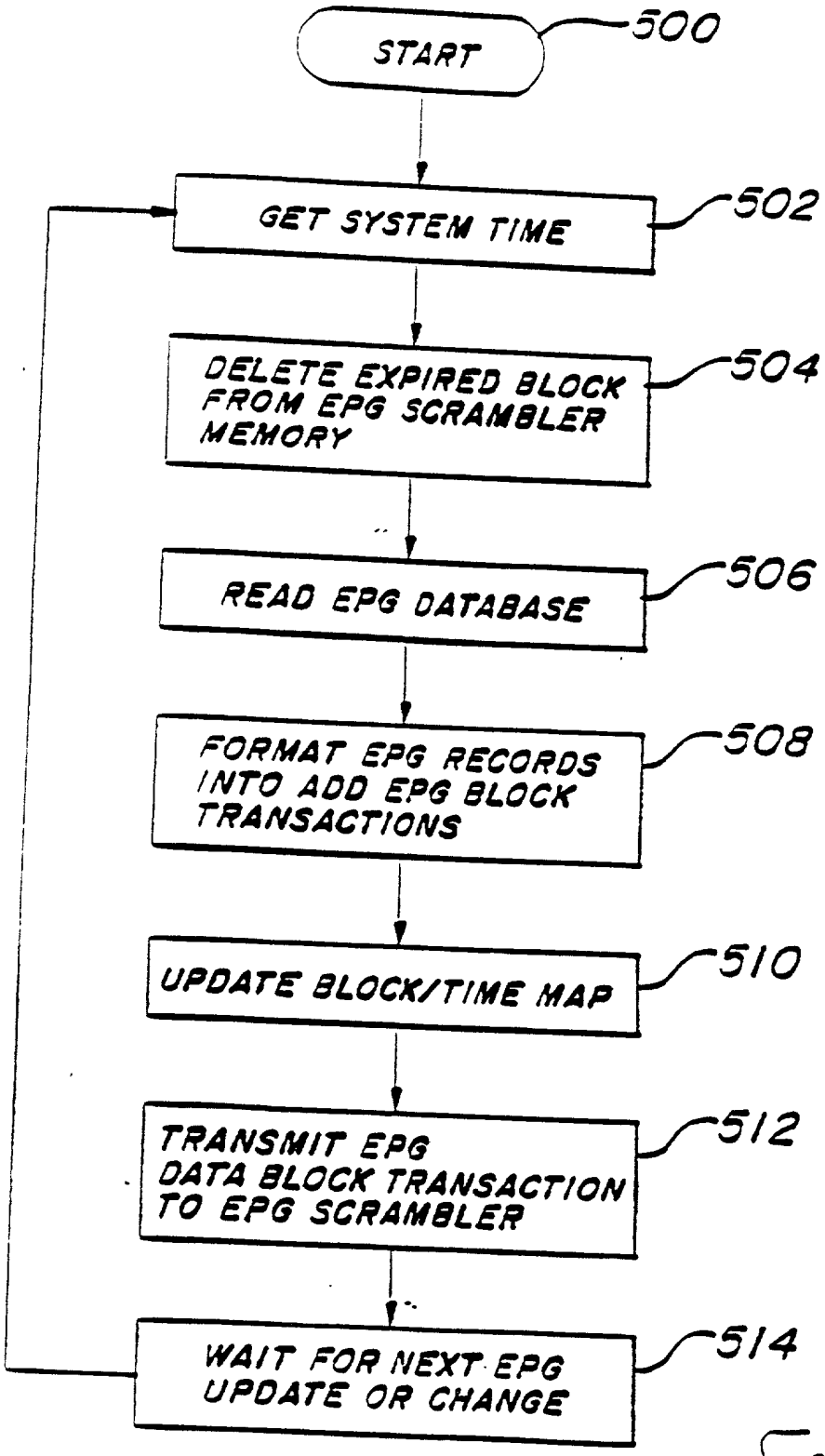


Figure 31

TEXT CHANNEL TRANSACTION FORMATTER 60, 62

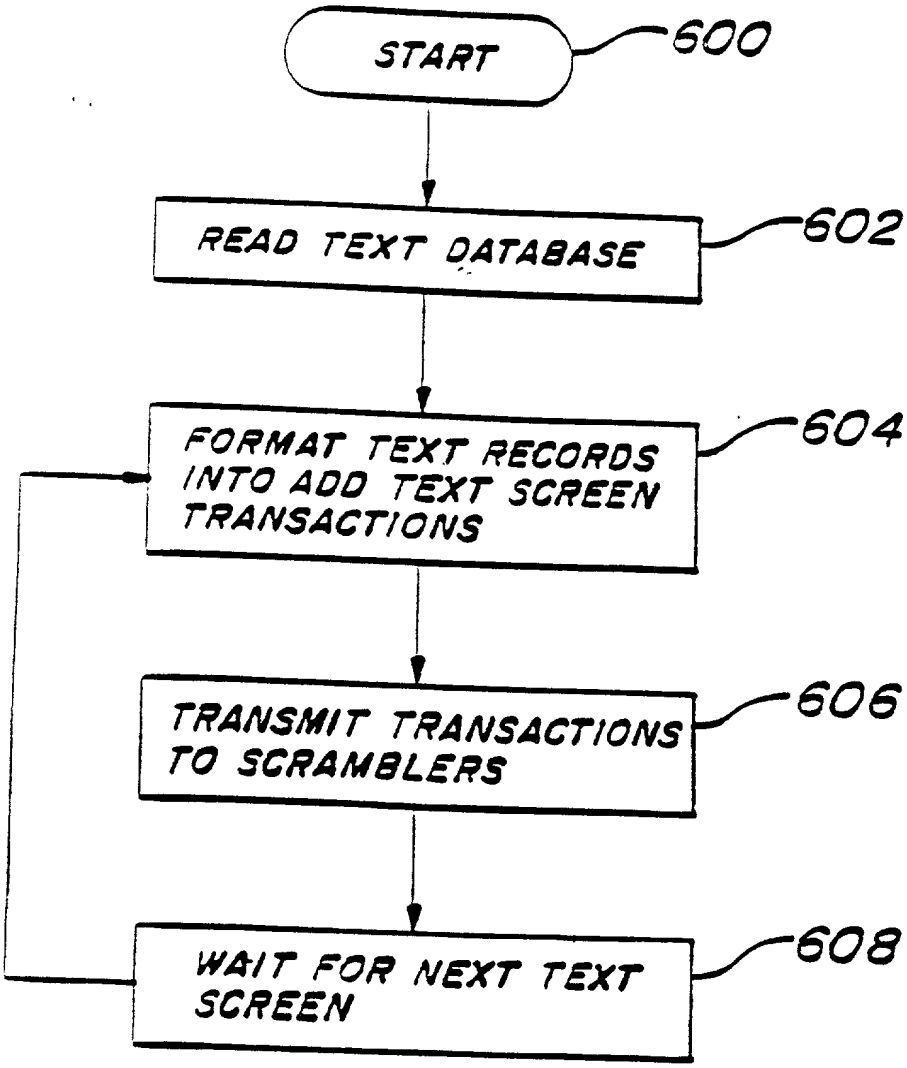


Figure 33

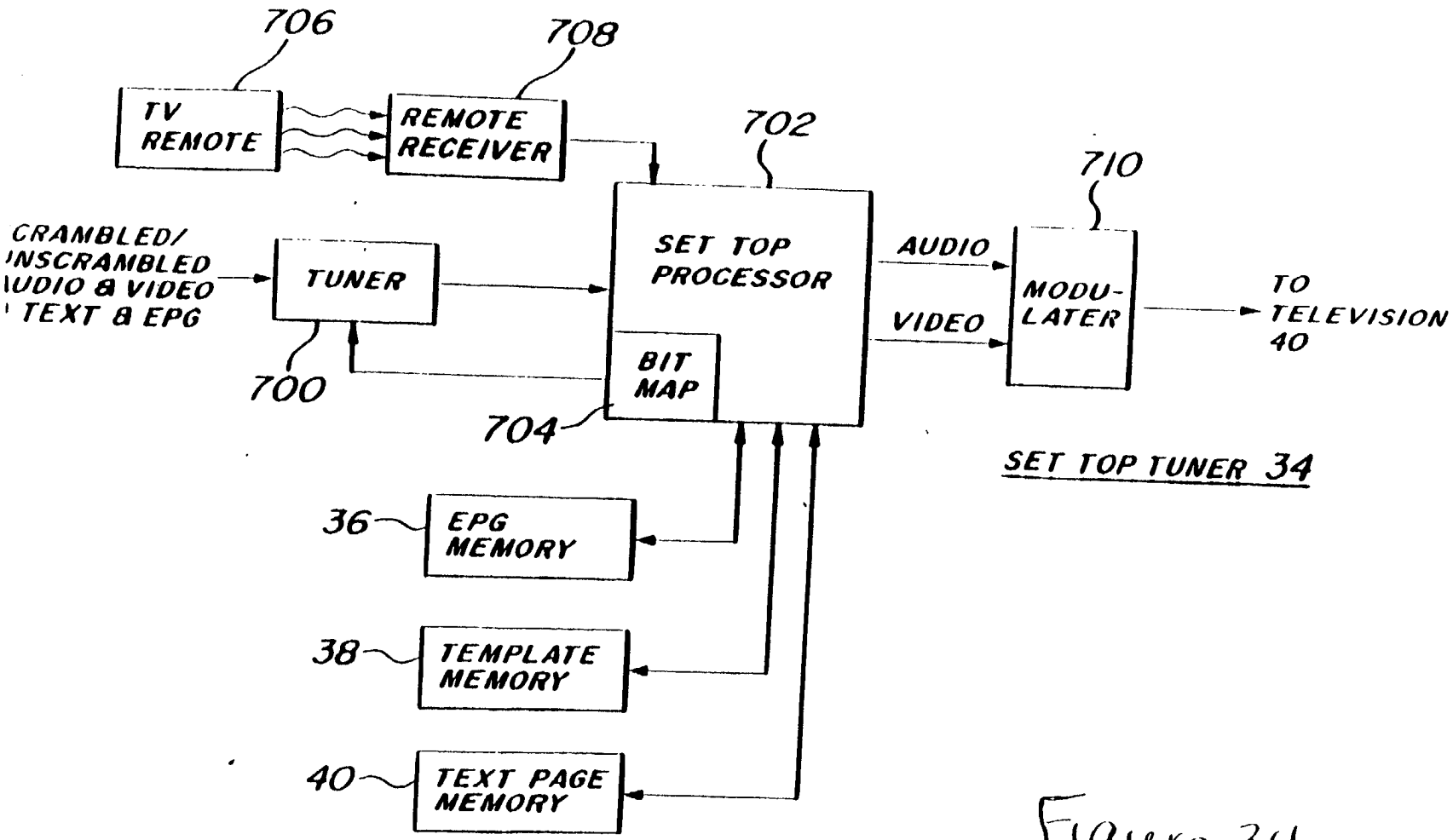

706
708
TV REMOTE
REMOTE RECEIVER
702
710
SCRAMBLED/
UNSCRAMBLED
AUDIO & VIDEO
& TEXT & EPG
TUNER
SET TOP PROCESSOR
AUDIO
VIDEO
MODU-LATER
TO TELEVISION 40
700
BIT MAP
704
SET TOP TUNER 34
36
EPG MEMORY
38
TEMPLATE MEMORY
40
TEXT PAGE MEMORY

Figure 34

Process for automatically creating multiple profiles and automatically identifying currently active profiles

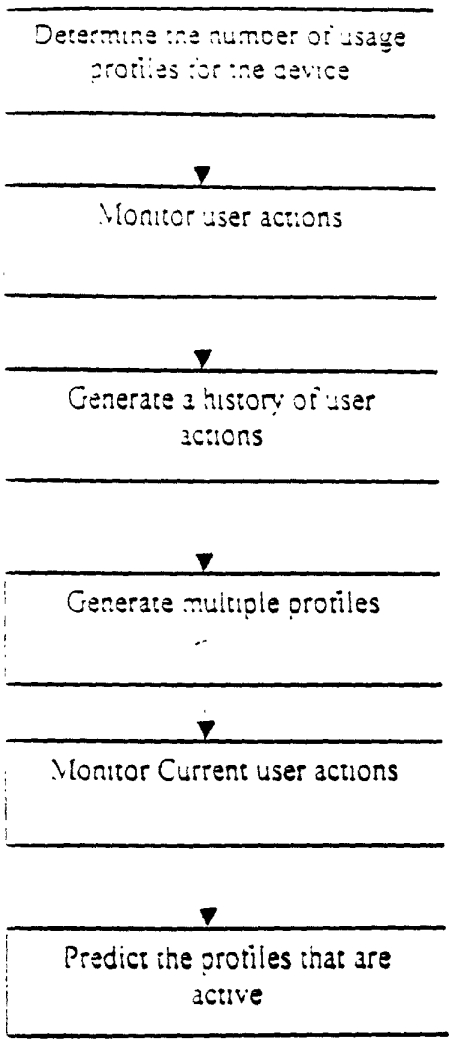


Figure 35

Process for generating multiple profiles

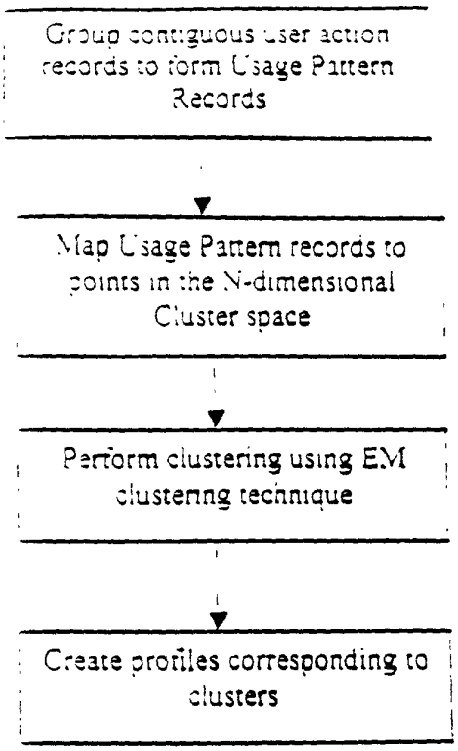
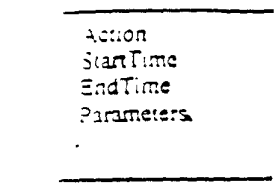
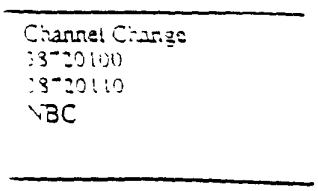


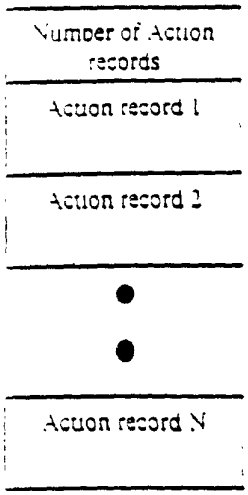
Figure 36



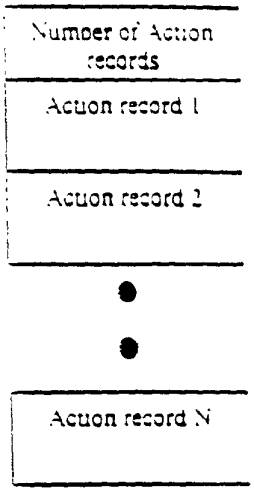
B) Format of user action record



B) Example of user action record

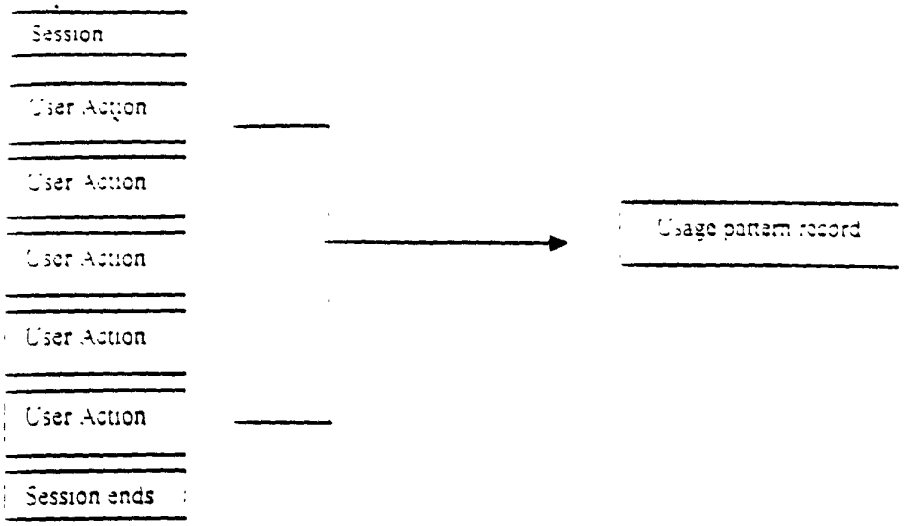


C) Format of History database

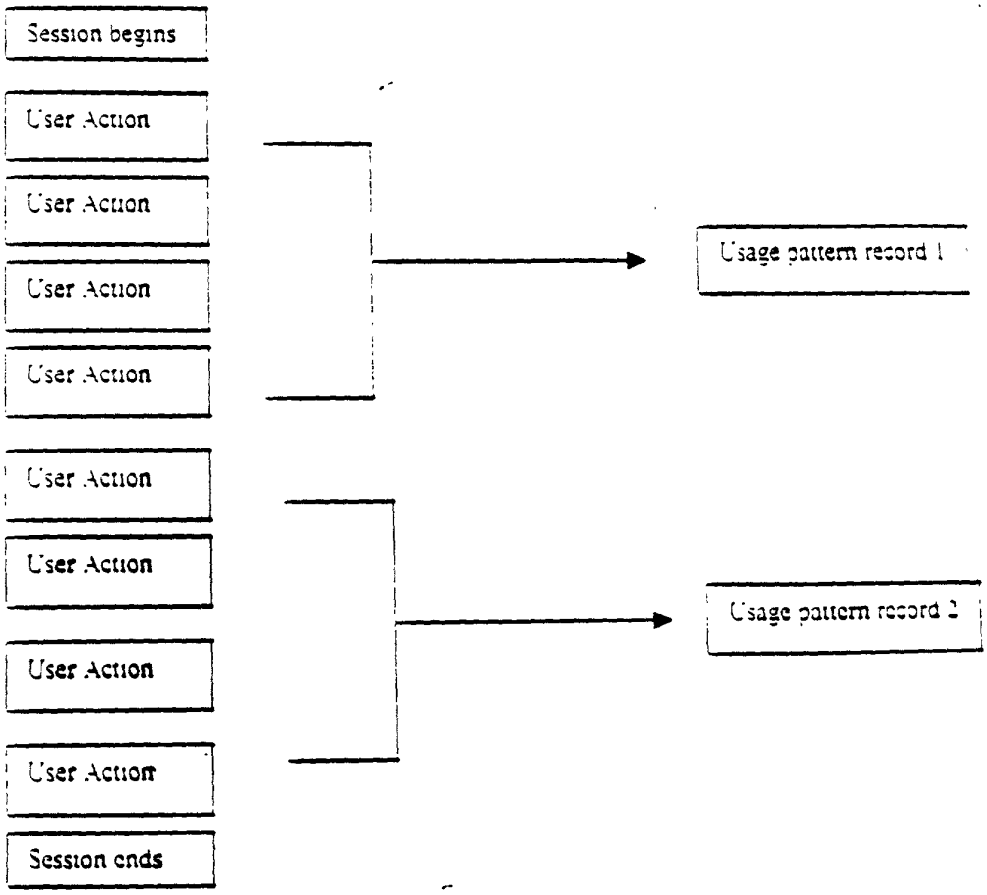


D) Format of Usage pattern record

Figure 37

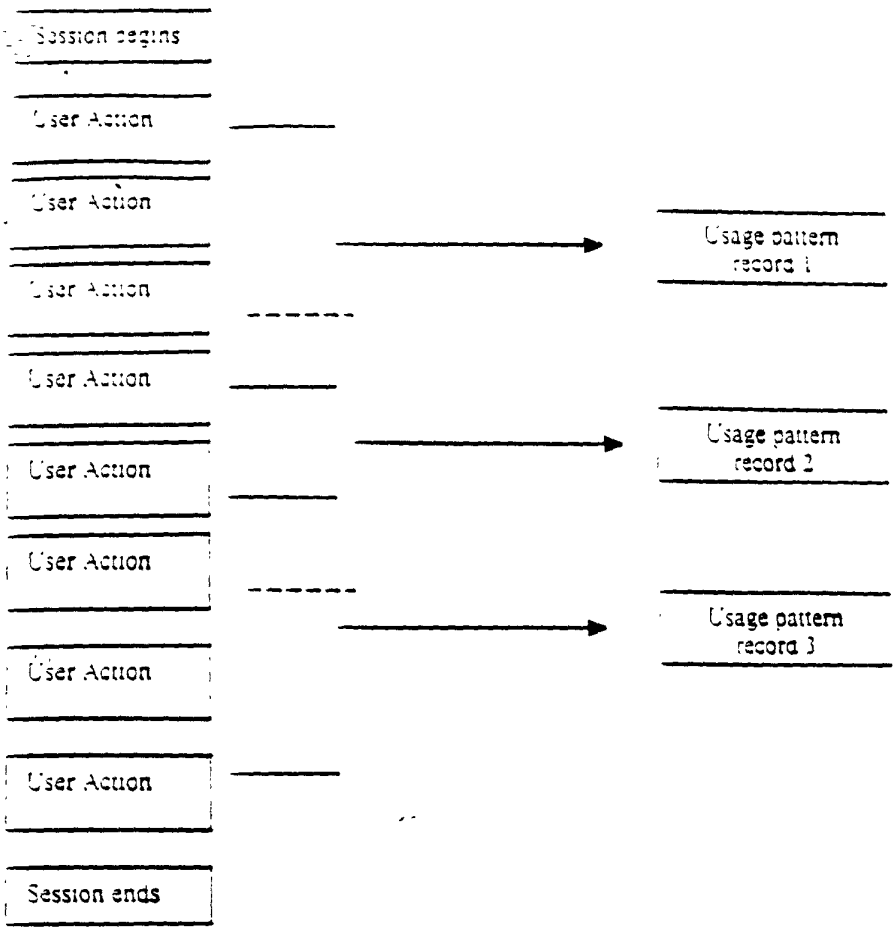


A) One method for creating usage pattern



B) One method for creating usage pattern

Figure 38



One method for creating usage pattern record

Figure 3)

Process for Predicting currently active profiles

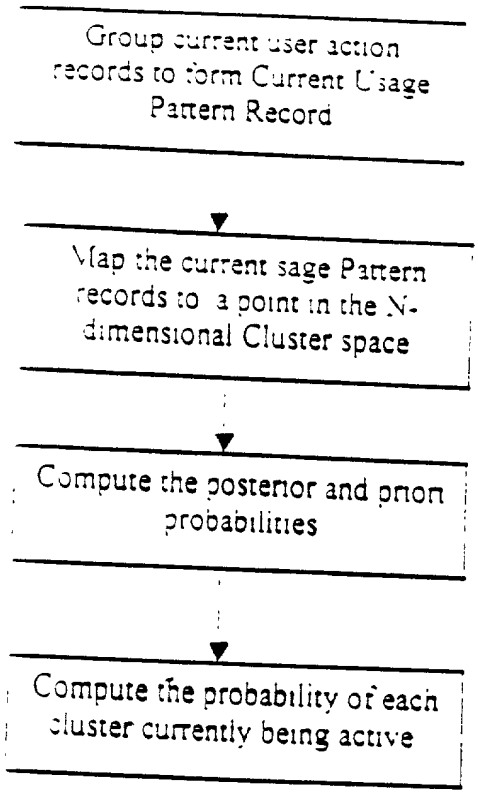


Figure 40

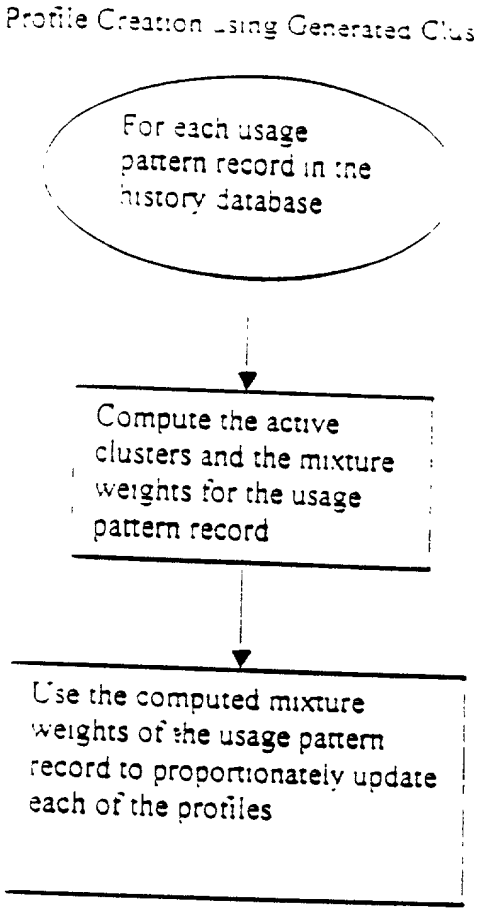

Profile Creation Using Generated Clusters
For each usage pattern record in the history database
Compute the active clusters and the mixture weights for the usage pattern record
Use the computed mixture weights of the usage pattern record to proportionately update each of the profiles

Figure 11

Targeted Electronic Content Distribution without compromising privacy of users

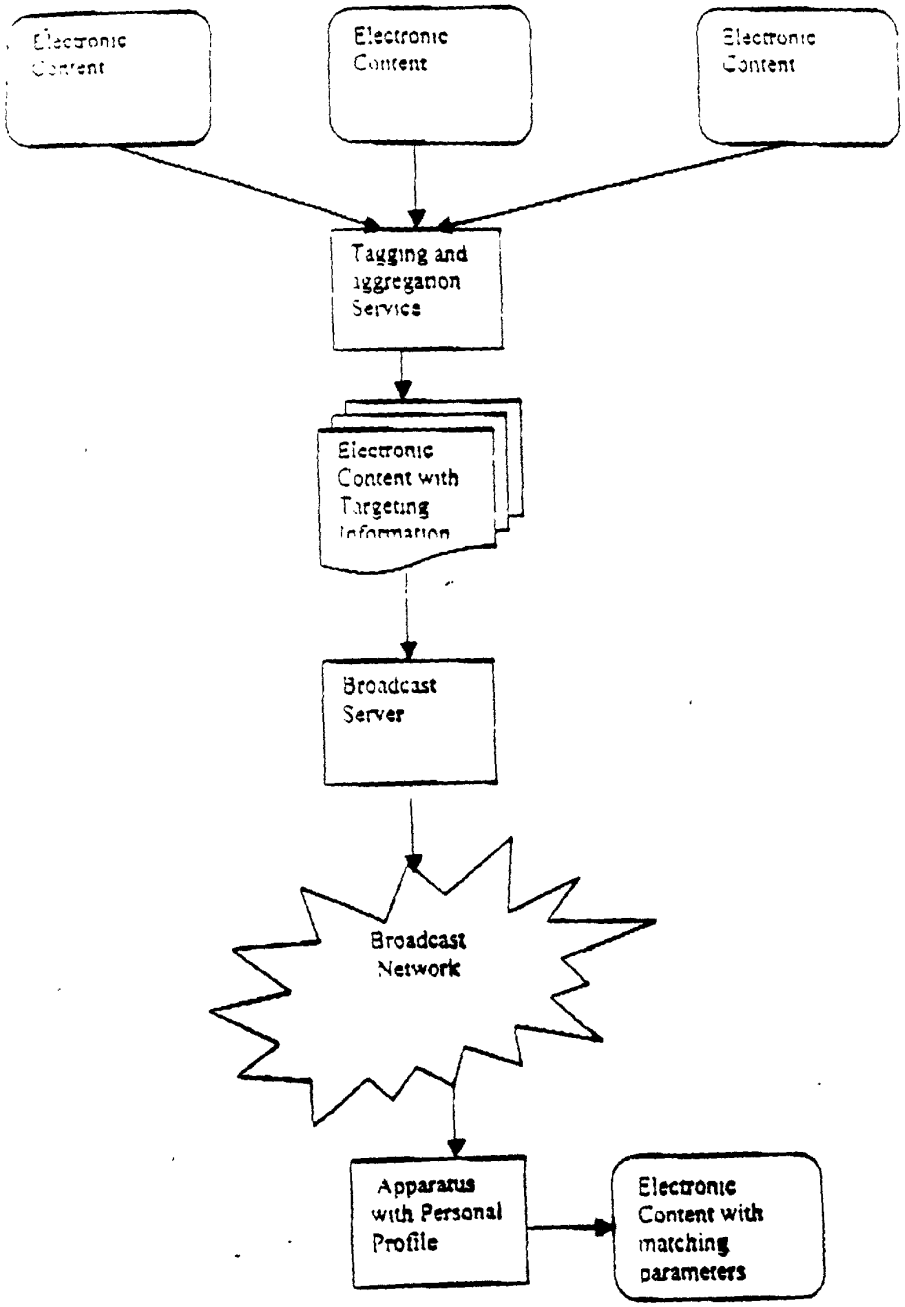
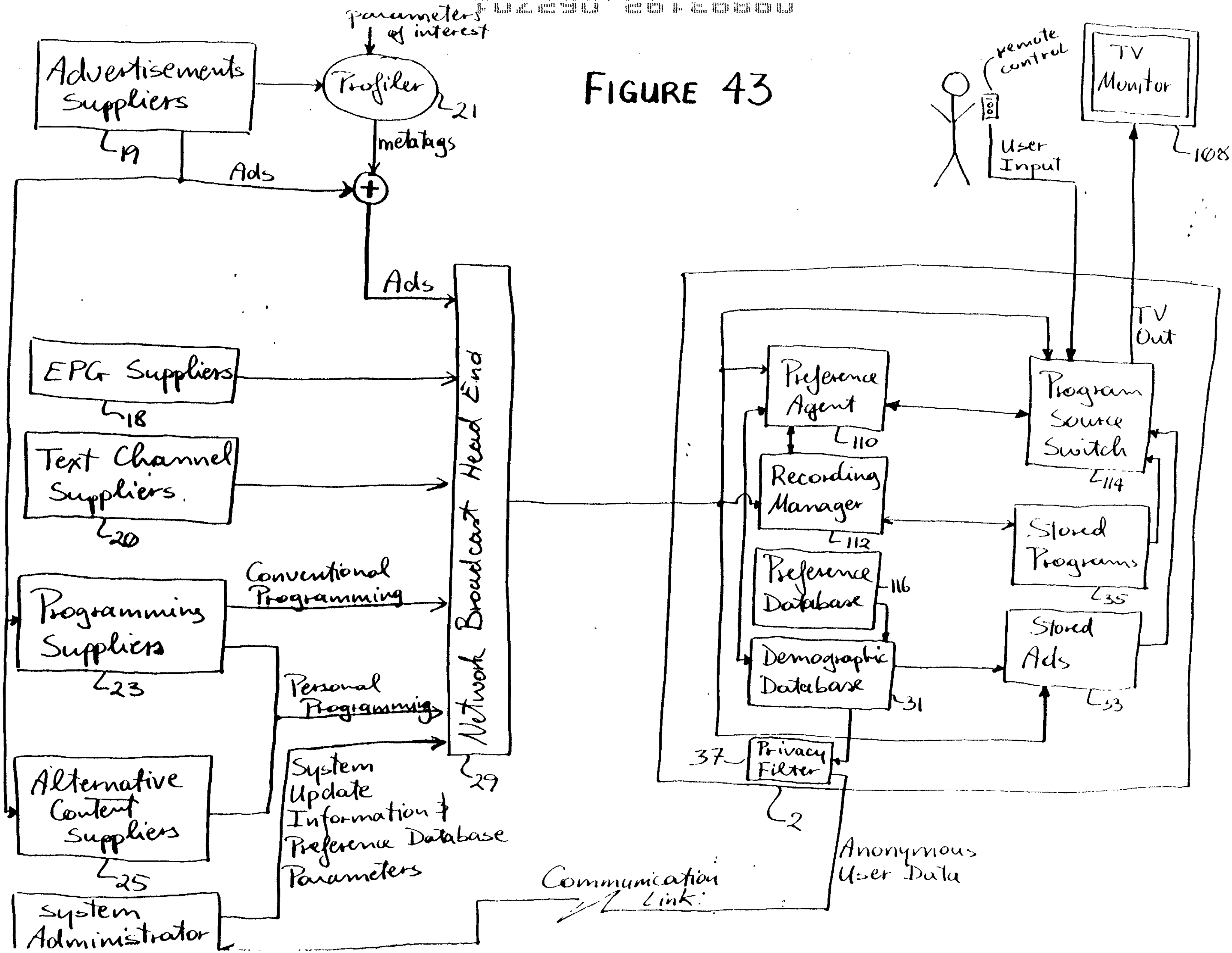


FIGURE 42

FIGURE 43



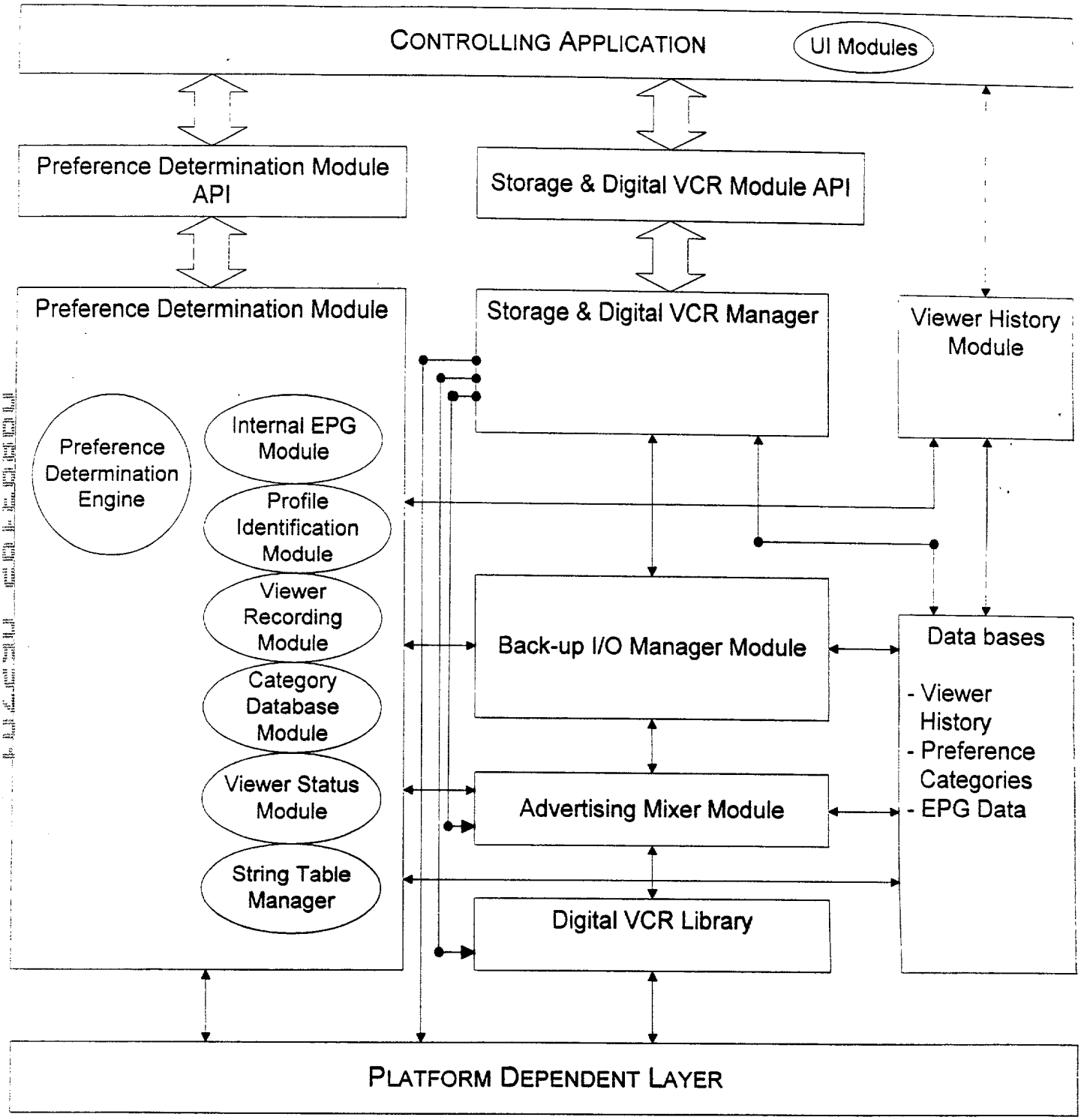

CONTROLLING APPLICATION
UI Modules
Preference Determination Module API
Storage & Digital VCR Module API
Preference Determination Module
Storage & Digital VCR Manager
Viewer History Module
Preference Determination Engine
Internal EPG Module
Profile Identification Module
Viewer Recording Module
Category Database Module
Viewer Status Module
String Table Manager
Back-up I/O Manager Module
Advertising Mixer Module
Digital VCR Library
Data bases
- Viewer History
- Preference Categories
- EPG Data
PLATFORM DEPENDENT LAYER

Figure 44.

Figure 45

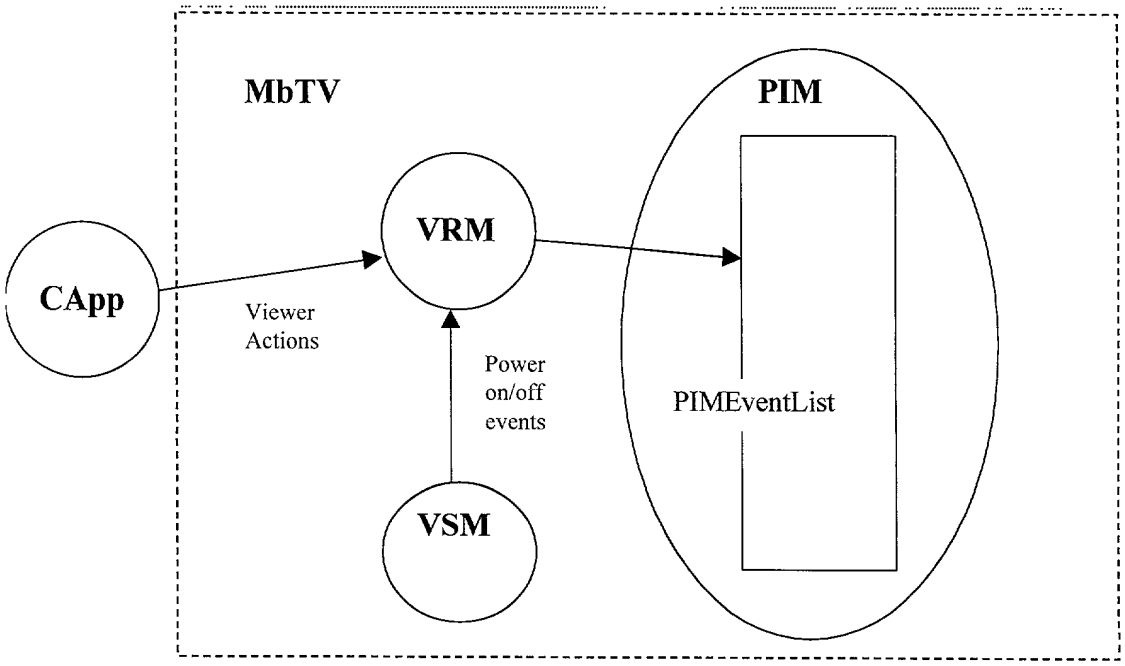

MbTV
PIM
VRM
CApp
Viewer
Actions
Power
on/off
events
PIMEventList
VSM

Figure 46

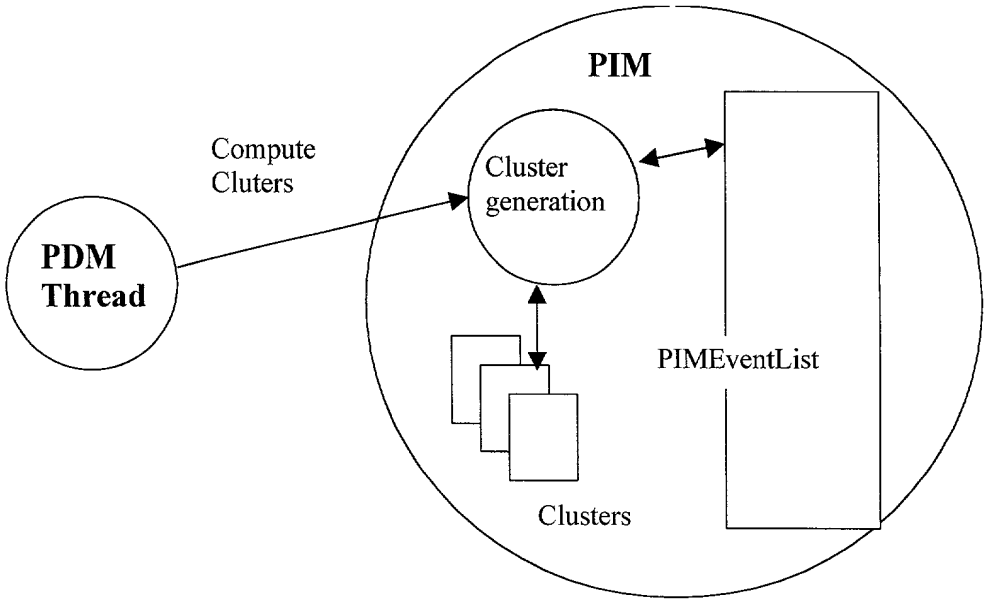
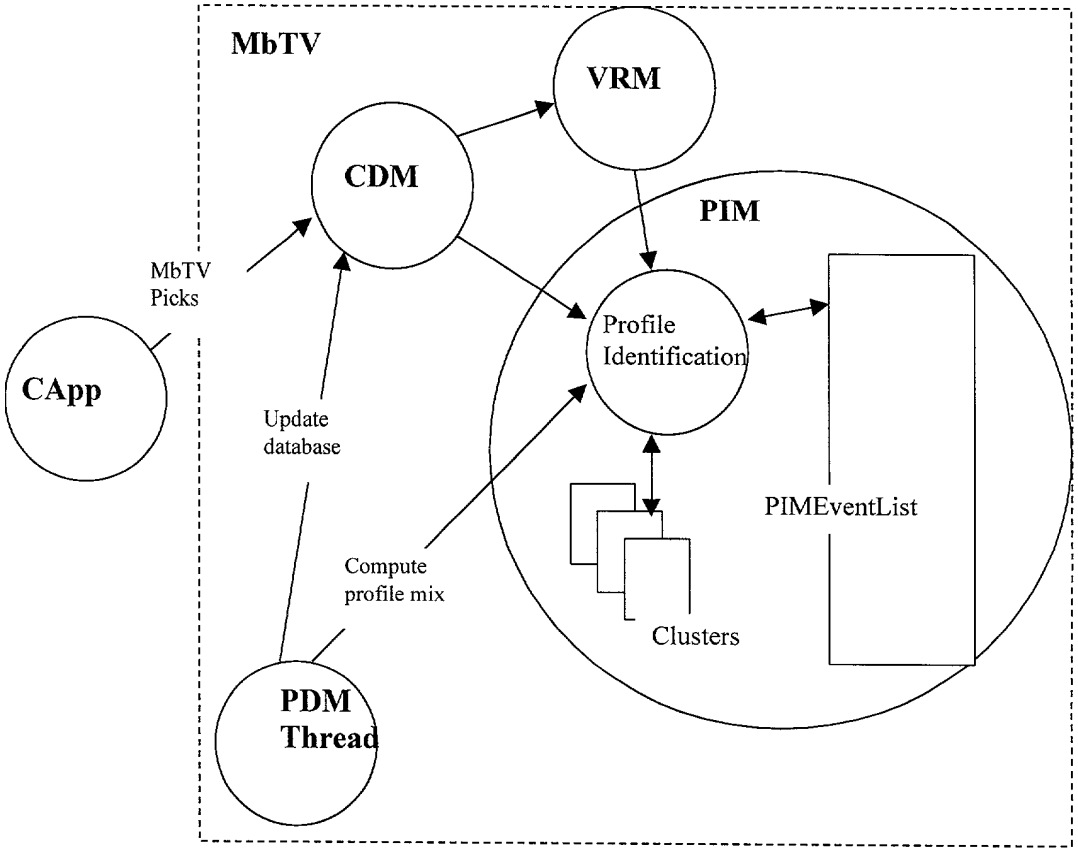

PIM
Compute
Cluters
Cluster
generation
PDM
Thread
PIMEventList
Clusters

Figure 47


MbTV
VRM
CDM
PIM
MbTV
Picks
CApp
Profile
Identification
Update
database
PIMEventList
Compute
profile mix
Clusters
PDM
Thread

PREFERENCE DETERMINATION ENGINE (PDE) ARCHITECTURE

Figure 48

CONTROL FLOW

DATA FLOW

CLICKS

REMOTE CONTROL (Input)

GUI GRAPHICS (Control Output)

VIDEO SERVICE (tuner + other h/w)

Broadcast TV eg Cable, Satellite, Terrestrial

RTOS

Config File

CLICK STRM

CAPP CONTROLLER APPLICATION (Native + MbTV extension)

CAPP

TIME

Get EPG

EPG Library Module

EPG LIB

EPG PROGRAM DATA

NATIVE SYSTEM (STB, DTV, PC)

bTV API

CALL

CALL-BACK

VSM -FGr. VIEWER STATUS Module for STB. TV Watched? TV ON?

CB

VRM -ForeGr. VIEWER RECORD Module

CLICK STRM DATA

MetaByte Network PREFERENCE DETERMINATION ENGINE

Get Best Pgms/ Rating

NOTIFY CALL

PROBABILITY PROFILE is ACTIVE

CDM-ForeGr CATEGORY DATABASE Mod. (Direct View and Manual Update)

PIM -ForeGr. PROFILE ID Module (Update)

CLICK STRM

EPG DATA

CLICK STREAM DATA

Active Profile DATA

EVENT LIST DATABASE

Re-Profile

Read Active Profile

Get Profile Mix

Get EPG

IE (-bg 1) INTERNAL EPG Manager

BEHAVIOR PRO

BEHAVIOR PRO

BEHAVIOR PROFILE

Read Preferences (direct view)

EPG DATA

PIM (-bg 4) PROFILE ID Module. x-ProfileAlgorithm y-ID Active Profile

PIM

CALL

VRM (-bg 2) VIEWER RECORD Module

VRM

1 - 2.

PDM BACKGROUND THREAD. CONTROL: 1, 2, 3, 4y, 5, 4x infrequ.

CALL

VIEWER RECORD DATA

IEPG DATA -EPG Snap Shots

CDM (-bg 3) CATEGORY DATABASE Module (Create, Update & Maintain)

CDM

CDM

ENHANCE and MAINTAIN USER PROFILEs

PREFERENCE DATABASE (aka Category DB)

(-bg 5) IO-MGR for BACK-UP (Save to non-volatile storage)

(-bg 6) VHM VIEWER HISTORY Module

VHM

VIEWER HISTORY DATABASE eg PGM DESCRIPTION

IO-MGR

Back-Up to Flash, HDD

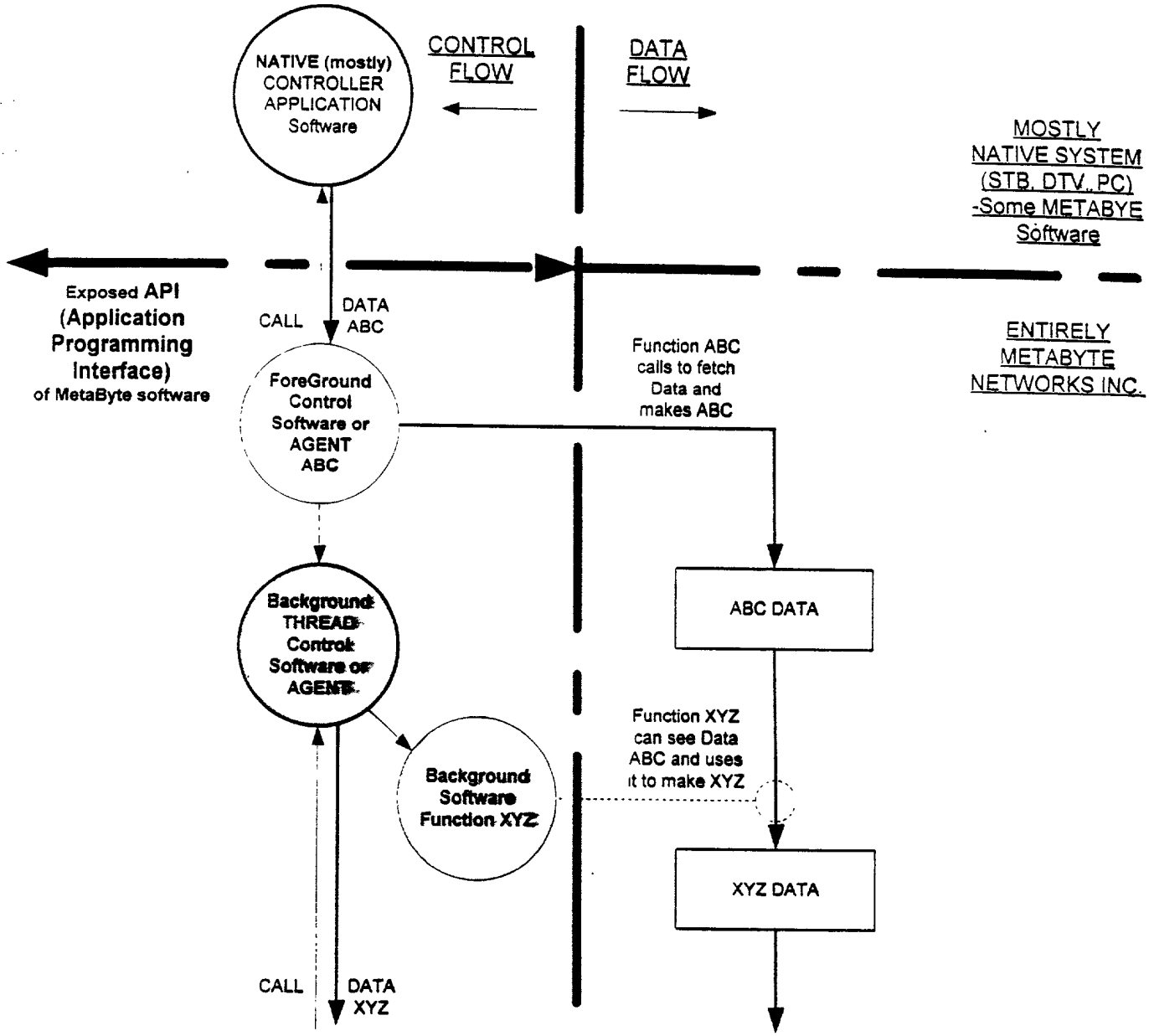
Accumulate Preference Data for 1 or 2 weeks before access by user agents eg Storage agent (SDM).

CALL VSM for Power On/Off data

CALL CDM for PREFERENCE DATA

CALLs by an Application using CDB eg Storage App -SDM

Figure 49


NATIVE (mostly) CONTROLLER APPLICATION Software
CONTROL FLOW
DATA FLOW
MOSTLY NATIVE SYSTEM (STB, DTV, PC) -Some METABYE Software
Exposed API (Application Programming Interface) of MetaByte software
CALL
DATA ABC
ENTIRELY METABYTE NETWORKS INC.
Function ABC calls to fetch Data and makes ABC
ForeGround Control Software or AGENT ABC
Background THREAD Control Software or AGENT
ABC DATA
Function XYZ can see Data ABC and uses it to make XYZ
Background Software Function XYZ
XYZ DATA
CALL
DATA XYZ

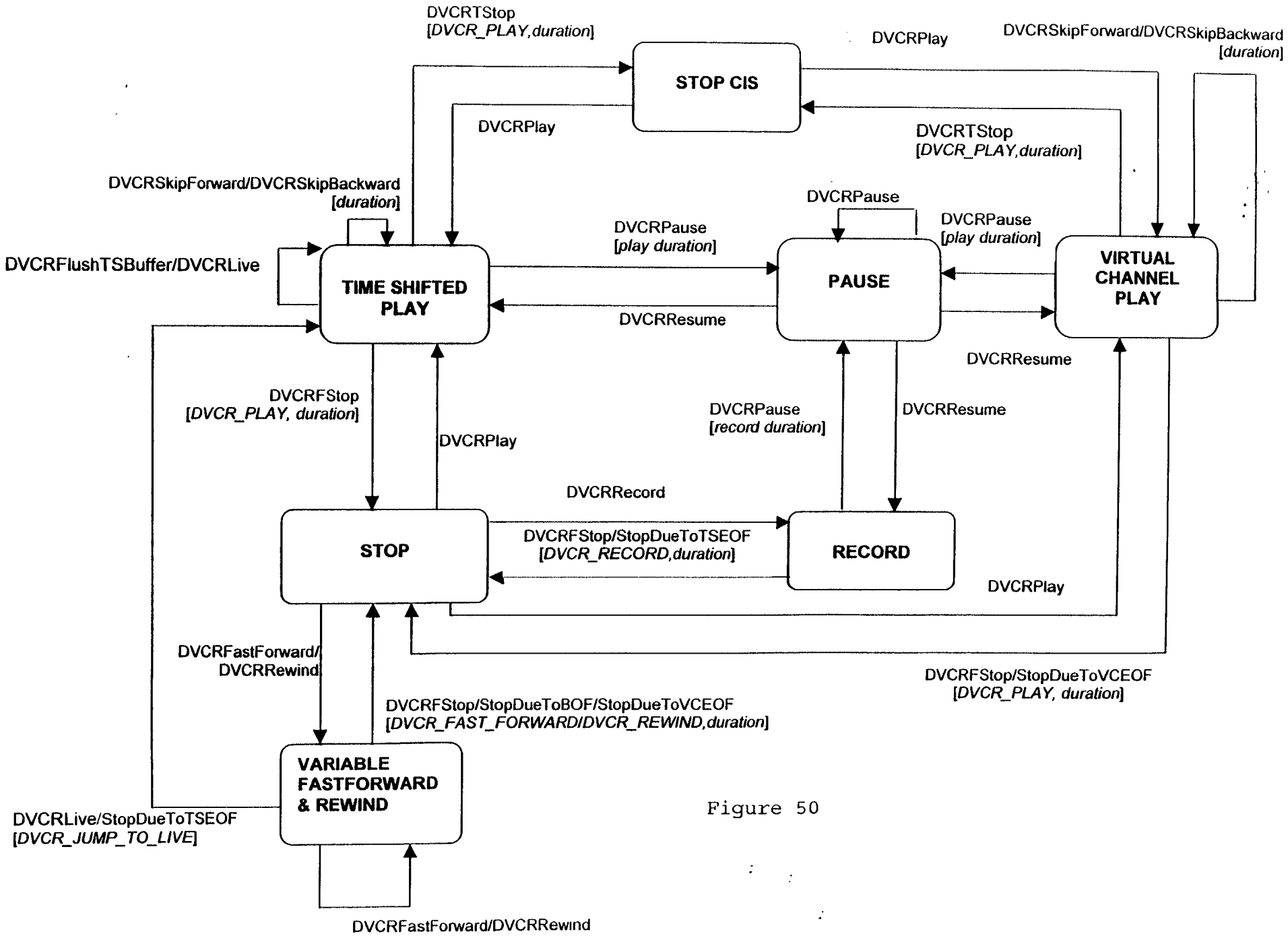


Figure 50

Figure 51

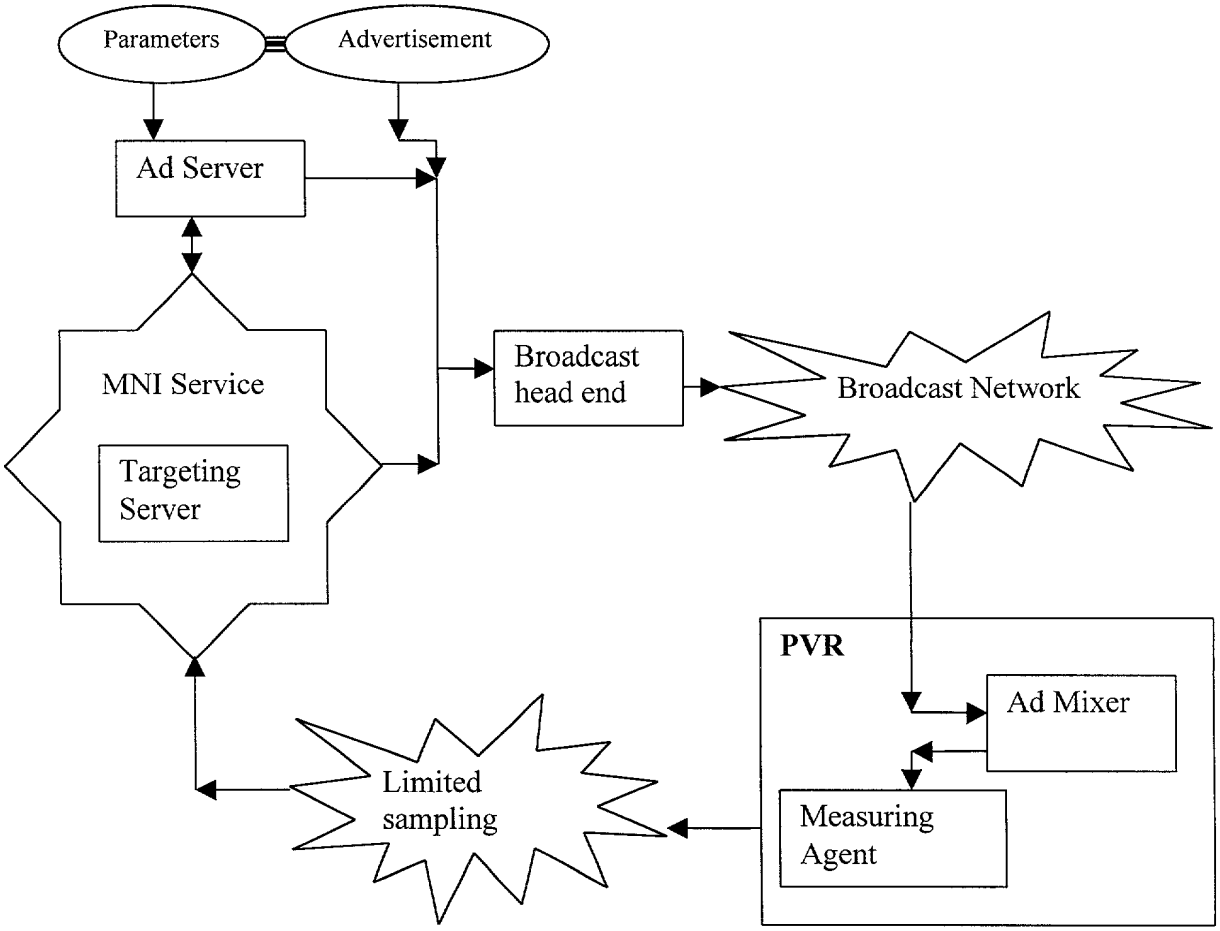

Parameters
Advertisement
Ad Server
MNI Service
Targeting Server
Broadcast head end
Broadcast Network
PVR
Ad Mixer
Measuring Agent
Limited sampling

Figure 52

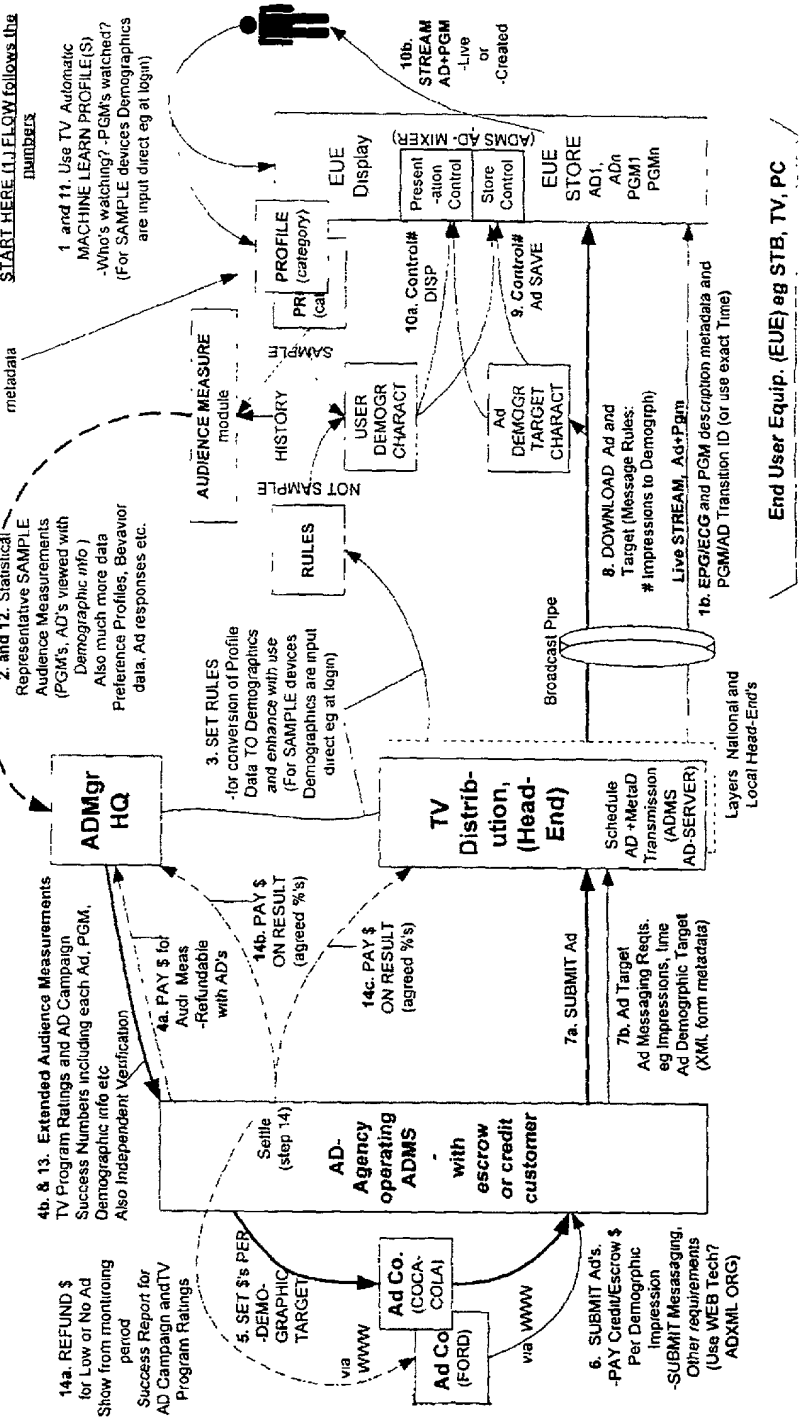


Figure 1, AD Mgr Operational Flow and Business Model

Figure 53

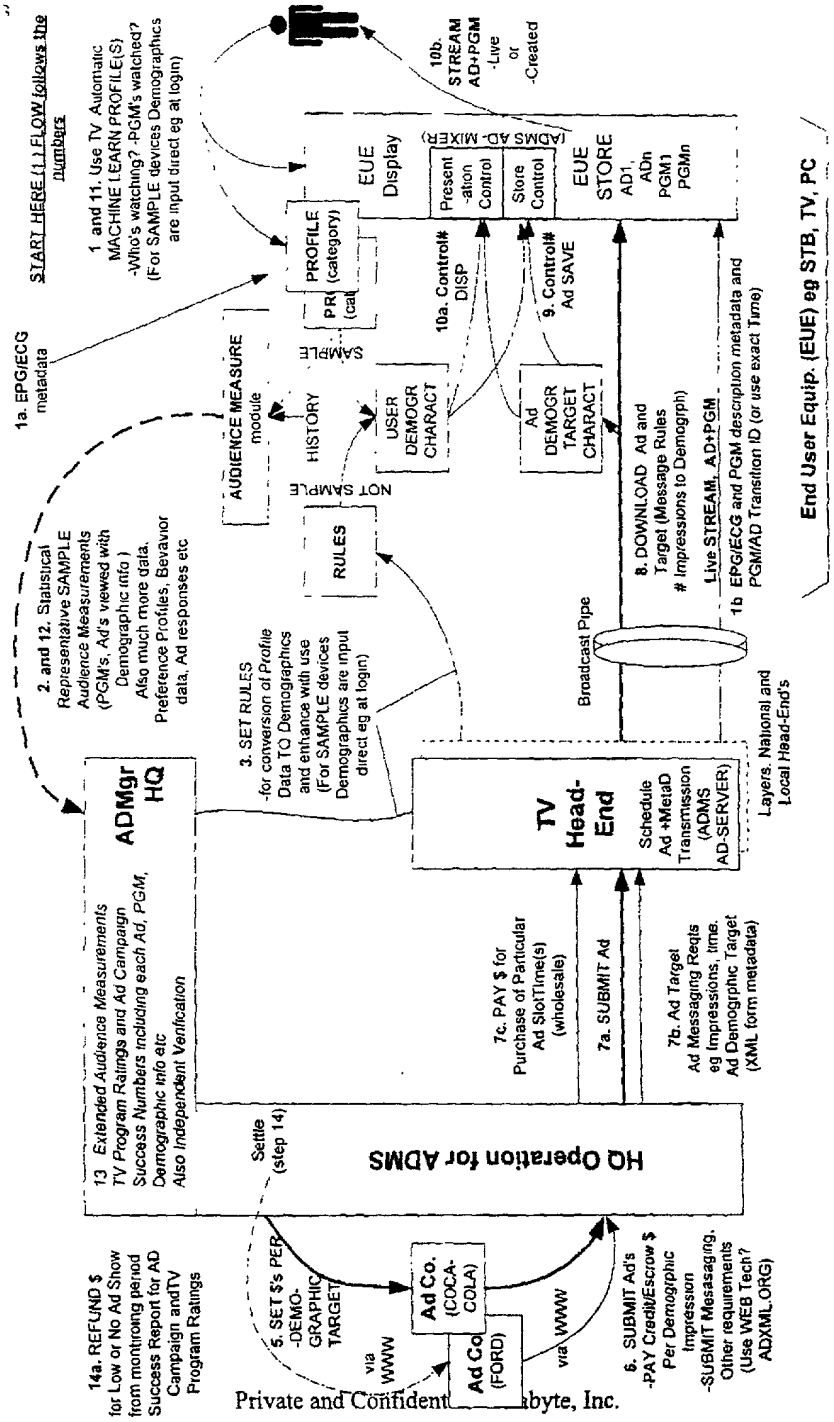


Figure 2. AD Mgr Operational Flow and Business Model 2

